

No. 14711

United States
Court of Appeals
for the Ninth Circuit

THE COLEMAN COMPANY, INC., a corpora-
tion, Appellant,

vs.

HOLLY MANUFACTURING COMPANY, a cor-
poration, Appellee.

Transcript of Record

In Three Volumes

VOLUME II.

(Pages 369 to 737, inclusive.)

Appeal from the United States District Court for the Southern
District of California, Central Division

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(Testimony of Jack Kice.)

The Court: Is there any objection?

Mr. Lyon: No objection to it on that basis.

The Court: Received in evidence as Exhibit 13.

(The document referred to was marked Plaintiff's Exhibit 13, and was received in evidence.)

[See Book of Exhibits.]

The Witness: I would merely like to point out that this is an FHA bulletin and does not apply to all houses, or the entire market.

The Court: You may leave the argument to the attorneys, Mr. Kice. You have enough to do giving testimony.

The Witness: I am sorry.

Q. (By Mr. Christie): Mr. Kice, if it were true that less than one-half per cent of houses in the United States were built with rough plaster of the type that you have indicated on Defendant's Exhibit AM, that would indicate that your drawing was wrong, would it not, and misleading?

A. No, it would not. I don't agree that that figure covers all of the houses in which wall heaters are mounted. As a matter of fact, we even go to the expense of providing a plaster ground for this grille that we show, we provide it [432] with every heater that we manufacture, because we think that is so important.

Q. And the fact that 99 per cent of new housing construction, according to this bulletin, does not apply to materials that you used on your illustration here, does not influence your testimony one way or the other?

A. It does not.

(Testimony of Jack Kice.)

Q. Now, Mr. Kice, referring to Plaintiff's Exhibit 20, which is the lower box, I call your attention to the projections on the back, which I will marked in pencil 1, 2, 3, and 4, and I will ask you if you know what those projections are.

A. I presume that you are required to have those projections to prevent direct contact with the inflammable wall material, such as wallboard.

Q. If this Holly heater were installed in the wall, after the wall was completed, would those projections hold the heater away from the wall, the rear of the wall?

A. It would all depend on where the irregular projections were. It couldn't be installed if it were held out.

The Court: If it were not or were?

The Witness: If it were held out.

Q. (By Mr. Christie): Did you mean what you said, Mr. Kice? Will you explain your answer?

A. If the projections held the box out from the wall, [433] it would give you some difficulty in making the installation.

Q. It could be installed, though, could it not?

A. After you knocked the projections out of the way.

Q. And isn't it likely that anybody encountering that situation would knock the projections out?

A. At the points of contact, undoubtedly. But you would tear a wall down if you tried to knock them all out of the way.

Plaster depends on the keys to hold it to the lath.

(Testimony of Jack Kice.)

Q. Now, getting back to this matter of wall construction, what constitutes proper wall construction, does the Coleman Company make recommendations with respect to the construction of walls of houses in which their heaters are installed?

A. We make some notation of types of walls in our instructions.

Q. I hand you Plaintiff's Exhibit 9—10, I am sorry. May we have the official copy, Mr. Clerk?

I call your attention to a writing on the inside of the front cover, and ask you if you know what the Coleman Trend Home is.

A. Yes, I do. I am very familiar with it.

Q. Would you say that it represents modern construction? [434]

A. The Coleman Trend Home represents trends that we see in the most—that are coming in house construction.

Q. Well, you would agree with me that the report says, in the second paragraph, that the Coleman Trend Home features many outstanding trends in modern home building?

A. That's right. By "trends" we do not mean that it is a thing that is already prevalent, however. For example, it showed the use of complete year-around air-conditioning, which is a trend, but still only a very small proportion of houses have it.

Q. Would the Coleman Company deliberately recommend what they considered obsolete housing construction?

(Testimony of Jack Kice.)

Mr. Lyon: Your Honor, that is objected to as purely an opinion of this witness.

The Court: It is argumentative. Sustained.

The Witness: I am afraid I don't understand the question.

Mr. Lyon: You don't have to answer the question, Mr. Kice.

Mr. Christie: May I have these two sheets marked for identification as Plaintiff's Exhibit next in order, No. 14?

The Clerk: 14 is the next number.

The Court: Do you wish them both marked as a single exhibit?

Mr. Christie: If you please, your Honor. [435]

(The documents referred to were marked Plaintiff's Exhibit 14, for identification.)

Q. (By Mr. Christie): Mr. Kice, I direct you to the two papers that have just been marked Plaintiff's Exhibit 14, for identification, and ask you to identify these as drawings made for the Coleman Company of the Trend Home, which you have just referred to in connection with Plaintiff's Exhibit 10.

A. Yes, these are floor plans of the Coleman Trend Home. * * * * * [436]

Mr. Christie: The witness has identified this exhibit. May I have it marked in evidence as Plaintiff's 14?

Mr. Lyon: This is objected to as merely adding to the record and not material in any way.

The Court: Overruled. It will be received in evidence [437]

(Testimony of Jack Kice.)

The Clerk: Plaintiff's Exhibit 14.

(The exhibit referred to was marked Plaintiff's Exhibit 14, and was received in evidence.)

[See Book of Exhibits.]

Q. (By Mr. Christie): Mr. Kice, you testified that the Coleman four-foot exchanger or economizer is provided with a ventilator header plate shown by the holes which his Honor asked you about, and which are about three-quarters of an inch in diameter at the base.

A. Yes, sir. [438]

Q. Why didn't you construct a 3-foot economizer with a ventilated header plate?

A. I think I pointed out in my testimony earlier that this air going up the outside was not necessary to the performance of our unit; that we simply used it—we simply provided it as being helpful, but not essential.

The Court: The question is why didn't you put them in the 3-foot economizer? Is there any reason?

The Witness: There's no particular reason to have them there, sir.

The Court: Is the 3-foot economizer less expensive, a less expensive device?

The Witness: Well, the overall device is less expensive.

The Court: Economy in manufacture to omit those holes?

The Witness: Economy in the tooling cost.

The Court: Is that the answer as to why they are omitted?

(Testimony of Jack Kice.)

The Witness: Frankly, I don't know of any other reason.

Q. (By Mr. Christie): Now, when you have a solid header plate as you have in the 3-foot economizer, you have a dead air space behind the lower box, do you not, unless there is a means for that air to rise in the space back of the lower box?

A. No. We do not have a dead space behind the lower box in any of our units.

Q. Where does that air that comes behind the lower box go then, in the case of the 3-foot economizer? [439]

A. It would pass out through the grilles marked 9 and 10, I believe, at the sides of the heater shell.

Q. And that is the only place that air could possibly go?

A. No. It would be possible for air to go up the edges of each side of the mounting brackets, because it is only $3\frac{1}{2}$ inches thick. But, in other words, if it were a 4-inch or $3\frac{3}{4}$ or $3\frac{5}{8}$, there would be a little space along there. It is not important whether it goes up or not.

Q. Does any of that air get into the economizer, into the jacket of the economizer and come out the upper grille?

A. I would say that any air that could get through there would be inconsequential leakage. We do not hermetically seal the unit.

Q. You testified that the air, some of the air that comes up the back, comes out of the opening of the grilles marked 9 and 10 on Plaintiff's Ex-

(Testimony of Jack Kice.)

hibit 24-A. You have also testified that there is some leakage from the lower, from behind the lower box in the Coleman installation, into the economizer, have you not?

A. I have testified there could be some leakage, but not necessarily.

Q. Now, have you any idea what the cross-section of the leakage path from the back and sides of the Coleman furnace is into the economizer, as compared with the cross-section [440] provided by the grilles, 9 and 10?

A. I would say that it is quite small. It is covered quite adequately in the report that was prepared for this case by the Foundation for Industrial Research.

Q. Now, would you say that if the cross-section outlet of the area or passageway which permits air to travel up the back into the economizer was of the same order of magnitude as the cross-sectional area provided by 9 and 10 louvres, that this leakage that you spoke about would be inconsequential?

Q. Would you repeat that, please?

Mr. Christie: Would you read that question, please, to the witness?

(Question read.)

The Witness: I think that the relative areas have very little to do—the relative amounts of leakage, since we in one case were comparing a grille area against the area of a long channel, the channel being something like 4 feet in length, and it may have a great deal of roughness or it could be

(Testimony of Jack Kice.)

smooth. But even at its smoothest we indicate an inconsequential leakage; even where we used glass as the back wall, to find out what would happen under the smoothest possible situation for that channel, we found the amount of leakage was inconsequential. So I will answer your question yes, it would be inconsequential. [441]

Q. (By Mr. Christie): Even though the cross-sectional areas of the two conduits were of the same order of magnitude?

A. In the first place, they are not of the same order of magnitude. And the areas have little or nothing to do with the amount of flow.

Q. What are their relative orders of magnitude, if you know?

A. It depends on the installation, sir.

Q. Now, Mr. Kice, I'd like to direct your attention, if you will for a moment, to Defendant's Exhibit Z; and particularly to the series of dotted arrows which you have shown on this drawing. I believe you testified that you prepared this drawing.

A. Yes, sir.

Q. Now, I will mark the arrows that I have in mind with the initials X, Y, Z, A, and B and C.

Now, Mr. Kice, were not those arrows intended to show air traveling up the back and sides of the Coleman lower box, and into the economizer or heater exchanger?

A. Those dotted arrows indicate the inconsequential leakage to which I have been referring, and the air---it will be noted there are two paths

(Testimony of Jack Kice.)

that those arrows follow; one going around the outside of the economizer——

Q. Would you indicate which arrows you have in mind by [442] referring to the initials I have made on them? A. Arrow C.

Q. Now, isn't this intended to indicate the gas going up back of the wall in the 4-foot economizer with the ventilated header plate?

A. The arrows that I have attempted to show there is the air that would leak past the mounting bracket, due to the fact that it is a little narrower than the average wall space in which it is located.

Q. And would this apply to the 4-foot economizer?

A. C would apply to both the 3-foot and the 4-foot economizer.

Q. Now, arrow B would also apply to both the 3- and 4-foot economizers?

A. No, it would only apply to the 4-foot.

Q. Why would it not apply to the 3-foot economizer, Mr. Kice?

A. I think you can observe that by comparing the construction of the 3-foot and the 4-foot economizers.

Q. Do you deny that there is gap through which gas can travel up the back of the heater into the 3-foot economizer?

A. I think I have stated before that we do not construct these things with a hermetic seal. There is a small space that is a result of needing a lip for spot welding the [443] vent pipe and the bottom

(Testimony of Jack Kice.)

of the box together. I think you have a similar lip in most any construction of this type.

Q. Now, referring to the——

A. We made this much less than normal practice, incidentally.

Q. Referring to Plaintiff's Exhibit 25-D, which is the 3-foot economizer, I will ask you to measure how wide this inconsequential space is that you testified about.

A. Well, as near as I can measure it with this rule, it is a quarter of an inch.

Q. Now, how long is that space, Mr. Kice?

A. The space would be divided into two parts, each approximately $3\frac{1}{4}$ inches by $\frac{1}{4}$. There is a sharp right angle turn which the air would have to go around, too, which is an important restriction which anyone familiar with air flow realizes.

Q. Now, you testified, Mr. Kice, that the Coleman economizer is essentially a ventilated flue pipe and is the same size as ventilated flue pipes. I am now speaking of the interior cross-section of the economizer, what we have referred to previously as the heater exchanger. Is that correct? I am referring in particular, Mr. Kice, to the cross-sectional area of the inner tube of the economizer.

A. The inner tube of the economizer fits a 4-inch oval Metalbestos, which is standard flue pipe for this size of [444] heater. It is the same size as our Model 60, before we built economizers.

Q. Could you identify for me the trade designation of the pipe that we are talking about so that

(Testimony of Jack Kice.)

we will know exactly what you mean? I am talking about the flue pipe to which this interior duct of the economizer is connected.

A. Well, the general designation used by the trade is a Type B vent, 4-inch oval—Type B vent.

Q. And are those all the same, so there won't be any confusion about terminology here?

A. No, there are slight differences in the size, exact shape of the various Type B vents. But they are practically the same.

Q. Practically the same?

A. We use an adapter to permit fitting the different shapes.

Q. Mr. Kice, what does the word "economize" mean to you? A. Saving something.

Q. And what would you call an "economizer"?

A. Something that saves something.

Q. Now, didn't you testify that the Coleman Company uses the word "economizer" when they just mean a ventilated flue pipe, and that the device is not intended to save any heat? [445]

A. No, I didn't say that.

Q. You are sure of that? What did you say, Mr. Kice?

A. I said that the heat that was saved was a plus factor in the operation of the unit. We did not depend on it to make the unit operate.

Q. But you do call it an economizer?

A. Yes, sir.

Q. A saver of heat? Correct?

A. That is correct.

(Testimony of Jack Kice.)

Q. And you would also agree with me, would you not, Mr. Kice, that there is heat exchange from the flue gases which go up through the economizer, both the 3- and 4-foot models, and the outer jackets, and the gas in the outer jackets of those models?

The Court: I will assume that if they weren't designed to save that heat, it would be sent out the roof. I think I am correct in that. It would go up the chimney, so to speak.

Mr. Christie: I asked the question because there seemed to be an implication in the witness' direct examination——

The Court: As I understand, these devices have a double purpose. One is to cause that heat to flow away from the wall, flow away from the device; and two, to have it flow out into the room and do some good; salvage it, so to speak.

Is that an unfair statement of the purpose, in your view?

Mr. Christie: That seems to be a fair statement.

Mr. Lyon: I think we can all agree with that, your Honor.

The Court: We are concerned here with methods of doing it.

Mr. Lyon: That is entirely the point in the case.

Q. (By Mr. Christie): Now, you testified that you observed the tests that Mr. Henry Landsberg made?

A. Yes, sir.

Q. And you further testified, Mr. Kice, that the SO₂ supply was adjusted at some time in the duration of that work.

A. Yes, sir.

(Testimony of Jack Kice.)

Q. Can you tell us, Mr. Kice, when you observed these adjustments, and who made them?

A. I am afraid I can't relate the time to the test for the simple reason that the test didn't make sense to me at all. I wasn't able to determine what they were trying to prove when the tests were originally run. It wasn't until they were nearly finished that I began to have an idea that they were using the supply there to attempt to prove anything about the flow. It was not explained to us what they were——

Q. Is it a fair summary of your testimony on this point then, Mr. Kice, to say that you didn't understand what was going on while the tests were being run?

A. You sure could. I still don't understand what they were trying to prove; or where it has a bearing on the case.

Q. You testified that you saw the gas adjusted. Who [447] adjusted the gas? I am now speaking of the SO₂ bottle.

A. I believe the adjustment was by both Mr. Landsberg and his assistant from time to time.

Q. Have you any idea how many times these adjustments were made?

A. I said it was more than once but I wouldn't say whether it was two times or six times. It was somewhere in between that number.

Q. Were these adjustments made while the data that Mr. Landsberg has testified to here was in course of collection?

(Testimony of Jack Kice.)

A. They were made during the tests. As I have explained, I can't relate the time to the operation of the Titrilog because it wasn't clear to me. Any adjustment made during the test would indicate, as far as I am concerned, that there was not a standard measured amount of flow in there on which these figures here are purported to be dependent.

Q. But you can't testify that you can relate the time of the adjustment to the collection of the data, is that a fair summary of your testimony?

A. I said that. * * * * *

WARREN BLAZIER

called as a witness by and on behalf of the defendant, having been first duly sworn, was examined and testified as follows:

The Clerk: Will you state your name, please?

The Witness: Warren Blazier.

Mr. Lyon: At this time I ask the clerk to mark the deposition of Warren Blazier, Jr., taken on January 5, 1954, as Defendant's next in evidence. And this is offered in evidence pursuant to the stipulation that we need not go over this matter again at this time; that both sides would accept the testimony as taken at the deposition.

Mr. Christie: That is correct, your Honor.

The Court: Very well. The deposition is received as Exhibit AI, Mr. Clerk? [449]

The Clerk: There is Q and R. Are you going to use those numbers?

Mr. Lyon: We will mark this as Q.

(Testimony of Warren Blazier.)

The Court: Exhibit Q is the witness' deposition. Are there any exhibits attached to it?

Mr. Lyon: And there is a book of exhibits attached thereto, which I will ask be marked as Exhibit R, and I offer it in evidence.

The Court: Very well. Both exhibits Q and R are received in evidence.

Mr. Christie: Correct, your Honor.

(The documents referred to were marked Defendant's Exhibits Q and R, and were received in evidence.)

[See page 543 for Exhibit Q.]

[See Book of Exhibits for Exhibit R.]

Mr. Lyon: Now, your Honor, I will not spend the time of the court to qualify Mr. Blazier, because he is qualified in this deposition, his qualifications are set forth.

The Court: Very well.

Mr. Lyon: Unless the court desires them to be read at this time.

I think Mr. Christie will agree that his qualifications have been set forth. Whether they are sufficient or not, I don't ask him to agree.

Mr. Christie: I will agree that whatever he said at Wichita in the course of his deposition, he said.

The Court: He will be deemed to have resaid here, is [450] that it?

Mr. Christie: And is deemed to have resaid here.

The Court: Very well, gentlemen.

(Testimony of Warren Blazier.)

Direct Examination

Q. (By Mr. Lyon): Mr. Blazier, are you familiar with the practice of evaluating the data, and getting the data from one of these furnaces for various A.G.A. tests as to efficiency?

A. Yes.

The Court: That is American Gas Association?

Mr. Lyon: Yes.

Q. (By Mr. Lyon): Have you actually made, personally, such tests on some of these heaters?

A. Personally I have been present when the tests were made. They were made as a part of work done under my supervision.

Q. Were you present at the taking of the deposition of Mr. Landsberg? A. Yes, I was.

Q. Was the test that was produced there in any way recognized by any of these testing authorities of these heaters?

A. I saw no relationship between it and any other specified testing procedure. [451]

The Court: Mr. Lyon, before you proceed further, was it your intention that Exhibit Q should be a part of the testimony of this witness here?

Mr. Lyon: Yes, your Honor.

The Court: Preceding the testimony that he is now giving?

Mr. Lyon: That's right. It is merely that I don't think that we need to repeat the testimony. It would take the better part of a day.

The Court: Do you wish it deemed copied into the record here at this juncture?

(Testimony of Warren Blazier.)

Mr. Lyon: I would rather have it marked just as an exhibit.

The Court: Very well.

Mr. Lyon: That the witness has so testified.

The Court: Anyway, it will be incorporated by reference at this point.

Mr. Lyon: Yes.

The Court: Is that agreeable, gentlemen?

Mr. Christie: That is agreeable, your Honor.

The Court: Very well.

Q. (By Mr. Lyon): What is one of the important things in determining the operation of one of these heaters, Mr. Blazier?

A. Well, I would say that one of the most important [452] things that you would have to establish would be that your testing procedure would be done entirely independently of the internal functions of the heater itself. In other words, your testing equipment and your monitoring techniques would have to be handled in such a manner as to not disturb the normal operating functions of the equipment.

Q. In other words, you couldn't set up false drafts and suction in the machine and get a true test of how that machine operated, could you?

A. You would not be able to evaluate the results, no. There would be too many indeterminate factors.

Q. Would you tell the court some of these things that would destroy the operation of one of these furnaces that entered into Mr. Landsberg's test, point them out?

(Testimony of Warren Blazier.)

A. Well, one of the first things that I would have been concerned about, if I had been evaluating the system, was the tunnel placed on the front of the unit. It is difficult to say just how the presence of that tunnel would affect the normal passage of air into the unit, that is, the combustion air, as well as the air for circulation. I felt that the rated conditions of the heater should be established, the specified rated conditions, before any evaluation was done, so that the unit was being tested in accordance with its normal configuration in an actual service application.

Q. That wasn't done? [453]

A. It was not done, no.

The second objection that I had to the technique that I witnessed was the sampling of air contained between the back of the lower box, which I believe is Exhibit 24, and the glass wall of the test set-up. My objection was the sampling of the air contained in that passage by a suction process. This set up an indeterminate condition in the back of the unit so that it would be difficult to determine to what extent the suction pressure or the volume of sample being drawn from that passage affected that channel.

In other words, this was not a normal operating situation for the unit.

Q. What is the normal stack differential pressure? I mean by that the pressure that causes the gas to flow up through the radiator?

A. I think in gas appliances it is in the neighborhood of two to three-hundredths inches of water.

(Testimony of Warren Blazier.)

Q. Could the pressure differential in the back on the outside, for example, of the box on Exhibit 24, the draft pressure, be greater than that?

A. It certainly shouldn't.

Q. What would happen if it was greater?

A. Well, many peculiar things might happen. You could have the flue gas itself taking that path for discharge, rather than the path up through the center of the radiator. [454]

Q. Do you mean it would suck it down and up around the back of the furnace?

A. If that pressure differential was there, it could very easily do that.

The Court: Does that same differential exist in the space between the ribs on the back of the box, the ribs and the wall?

The Witness: Under normal operating conditions I would say no, your Honor.

Q. (By Mr. Lyon): It can't without sucking the combustion fumes up there, can it?

A. No.

Q. You heard Mr. Landsberg state that there was a suction of two inches. How many times is that of the maximum pressure in the radiator?

A. If we speak of the range of draft in the radiator as varying from two-hundredths to three-hundredths of an inch of water, a two-inch suction pressure at the back of the test area would represent a pressure between 70 and 100 times greater than the normal stack draft.

(Testimony of Warren Blazier.)

Q. In other words, you might be, and probably were, drawing gases from the radiator with such a pressure?

A. I would seriously consider that as something that could occur, yes.

Q. Now, how can you explain the fact, or can you explain [455] the fact that Mr. Landsberg had a lower concentration at the entrance to the heater of SO_2 than he had at points behind the heater, and yet there was only one opening, can you explain that?

A. That was the point that bothered me, one of the things that bothered me about the entire test that I witnessed. There was a great inconsistency in the data that was being taken, and I saw no way for a higher concentration of gas to exist at a point different from that at the source.

One could speculate as to how this could occur, but it certainly is the type of data which is unreliable and undependable.

Q. Wouldn't the only possible way have been to suck some of the combustion gases into that back chamber?

A. That would have been one possibility to consider, since the Titri-log was also sensitive to mercaptans and things of that nature that could be present.

Q. Would you give us any other samples of faulty technique in taking this test?

A. Well, throughout the test I was also concerned by the fact that no attempt was made to

(Testimony of Warren Blazier.)

continuously monitor the rate of injection of the sample gas into the tunnel in front of the unit, in front of the heater.

Q. What happened about the monitoring of the gas, can you tell us some of that? [456]

A. Well, as I say, I was quite confused, because it seemed to me that during the process of the test there were occasionally changes in the valve settings of the sample gas that was being injected into the unit, and it was difficult for me to tell whether this was a part of the test or just what was actually happening. The whole test was difficult for me to follow in its consistency.

In tests involving concentration products and things of that nature, the value of concentration comparisons is only good if you can be certain that your conditions are the same throughout the extent of the test. And the lack of any actual monitoring of the injection of sample gas, plus the obvious variation in the consistency of the data from point to point made me seriously question the technique in itself.

Q. As an expert and engineer in this field of gas appliances, would you say that the tests of Mr. Landsberg had any justification in their final results?

A. I would say that they were of absolutely no value.

Q. Now, how do you determine the quantities of gases flowing in these furnaces? What techniques have you used?

(Testimony of Warren Blazier.)

Mr. Christie: Your Honor, I believe that is going to be repetitious of the testimony that we have already put in via the exhibit. I had no intention of agreeing to that if we were going to get a mere repetition.

Mr. Lyon: I am sorry. I recall that is in the deposition, [457] and I will strike the question.

The Court: Very well.

Q. (By Mr. Lyon): Now, in the patent in suit, Mr. Blazier, there is a statement that they must paint the inner radiator or flue pipe black——

Mr. Christie: Would you identify the place you are speaking about, Mr. Lyon, so that we may follow you?

Mr. Lyon: I am not asking him, your Honor, about the patent. I just want to find out why.

That is in column 5, line 22, down to 26.

Q. (By Mr. Lyon): What is the object of painting a radiator or flue pipe black?

A. Well, to increase its radiation.

Q. I call your attention to the fact that in the defendant's structures, both the three-foot and the four-foot economizer, they are painted aluminum; what is the reason for that?

A. Well, it is my opinion that the reason would be to keep the outer jacket of the economizer at a lower temperature than it would run if the flue pipe were painted black. [458]

* * * * *

(Testimony of Warren Blazier.)

Cross Examination

Q. (By Mr. Christie): Mr. Blazier, have you ever run any tests with a Titrilog?

A. No, sir.

Q. Have you ever seen a Titrilog, except during the taking of the Landsberg deposition?

A. No.

Q. So your familiarity with a Titrilog is completely restricted to what you saw on that occasion?

A. As an instrument for measuring SO_2 , yes.

Q. As an instrument for other purposes have you ever used it?

A. No, sir.

Q. I noticed——

Perhaps we can dispose of this by stipulation. Mr. Lyon, will you stipulate that when you referred to the black surface of the radiator, with reference to column 5 of the patent, that you were talking about the black surface on the radiator 15?

The Court: The patent itself so states.

Mr. Lyon: That's right, your Honor.

The Court: That is the radiator in the lower box.

Mr. Christie: Yes. And in your question to the witness you did not refer to that radiator—— [459]

Mr. Lyon: I made an error, your Honor. I should have referred to the other radiator.

The Court: Your answers would apply wherever "black" was used, I suppose?

The Witness: That is correct.

Q. (By Mr. Christie): Mr. Blazier, I hand you a copy of Defendant's Exhibit V and call your attention to the passage beginning on the bottom

(Testimony of Warren Blazier.)

of page 35. At this point Mr. Lyon was examining Mr. Landsberg, and he said:

“I have a question for the witness. Does titanium dioxide in any way affect this instrument you have been using, to your knowledge?

“A. No. We can prove that if you like.

“Mr. Lyon: Let’s take a test. I would like to see what happens.

“Mr. Hoegh: At what point are you sampling, Mr. Landsberg?

“A. No. 4, I believe it was. No, No. 3.

“Mr. Lyon: If it had any real effect it would bounce it hard with that amount of concentration.

“A. Yes.

“Mr. Lyon: All right. Give it some smoke.

“A. I see smoke going right by the point of sampling.

“Mr. Lyon: It has substantially no effect that [460] I can observe or you can on your machine.

“A. Right.”

Now, did you observe this incident?

A. Yes, I was present.

Q. Do you agree that the smoke went right by the sampling point?

A. It was injected with quite a velocity. It was a squeeze on a bulb, and there was a puff of smoke that did pass by. [461]

Q. And it went right by the sampling point?

A. Yes.

Q. So that it was not sucked in at the sampling point?

(Testimony of Warren Blazier.)

A. Well, that was hard to tell. I mean, there was a big puff that was squeezed into the back of this chamber that we have been talking about, and the purpose of the test was to determine whether titanium dioxide affected the readings of the Titri-log. And it was my observation that this puff of smoke was simply injected. I didn't make any particular observation as to whether there was anything sucked into the Titri-log or not.

Q. But you will agree that the titanium dioxide was injected right at the bottom of the furnace?

A. I don't recall that. I don't recall at which point that was injected. He says here——

Q. Reading from the record?

A. Line 23. This answer: "No. 4 I believe it was. No, No. 3."

If that is referring to the point of injection of the titanium tetrachloride, then this would be at a point, as I recall, quite a ways up on the back of the box. So I don't really recall just where that was. I remember the test was taking place. And my attention at the time was directed to the Titri-log. I was waiting to see if there was a large shift in its reading. [462]

Mr. Christie: That completes our cross examination on this witness, your Honor.

The Court: Mr. Blazier, in your opinion is the Titri-log itself an instrument that does what it purports to do, if properly operated?

The Witness: Yes, your Honor. I have absolutely no objection to the Titri-log as an instrument.

(Testimony of Warren Blazier.)

I think, as a matter of fact, it's an instrument that our organization is considering purchasing.

The objection that I had was to the application of the Titrilog to this particular testing procedure. The instrument itself is a very good instrument for analyzing sulphur concentration.

The Court: Now, Mr. Landsberg made use of a certain formula. Do you have any criticism of his algebra in that matter?

The Witness: No. Mr. Landsberg's formula was satisfactory as far as the derivation of how a concentration of products can be used. My objection was to the method of collecting the data that was put into the formula. The test procedure was such that you had no assurance that the data itself was reliable.

The Court: According to his computation, as I recall, 57 per cent of the outlet of the upper vent to the economizer was sulphur gas. Now, did you observe the test? [463]

The Witness: Yes, I observed the test. I would like to explain one thing here at this point, if I might. We ran tests in my organization to evaluate this quantity of flow that seems to be the subject of all the conversation, the flow up the back. And the method we used we felt was one which was independent of the operation of the unit itself. And the value which we obtained was a value which, based upon the total delivery of the air from the economizer grille, that the total volume of air that was moving up the back of the unit, starting up

(Testimony of Warren Blazier.)

the back, was less than 4 per cent—or, rather, it was around 4 per cent of the total flow that was coming out at the grille.

The Court: You made a test to determine the source of the air that was coming out of the grille?

The Witness: That is correct. We tried to determine the contribution of the air up the back to the total coming out of the grille. And the air coming up the back has several paths that it takes. We observed this visually as well as experimentally. And so that the 4 per cent which we measured was that of the starting quantity of gas that started up the back, but part of that 4 per cent took other paths and into the economizer. So that our conclusions from the work that we did were that the contribution of the leakage flow up the back of the unit to the total delivery of the economizer was less than 4 per cent of that total delivery, and we cross [464] checked these figures by two different methods; the two methods being entirely independent of each other. One was a chemical method of approach and the other was an engineering method of approach. Both methods were based upon measurements and analysis external to the——

The Court: Well, are those methods described in your deposition?

The Witness: I believe they are in the deposition, yes. [465]

* * * * *

GEORGE PETOFF

called as a witness by and on behalf of the defendant, having been first duly sworn, was examined and testified as follows:

The Clerk: Will you state your name, please?

The Witness: George Petoff.

The Clerk: How do you spell it, please?

The Witness: P-e-t-o-f-f.

Direct Examination

Q. (By Mr. Lyon): Where do you reside, Mr. Petoff.

A. I reside at 620 Woodlong Boulevard, in Wichita, Kansas.

Q. And what is your occupation?

A. I am a mechanical engineer.

Q. By whom are you employed?

A. I am employed by the University of Wichita Foundation For Industrial Research.

Q. Could you give some of your scholastic background, [469] Mr. Petoff?

A. I was graduated as a mechanical engineer from Rensselaer Polytechnic Institute, Troy, New York, in January, 1951.

Q. What degrees did you receive, if any?

A. I received a Bachelor of Mechanical Engineering degree.

Q. By whom have you been employed since that time?

A. I was employed by Chance-Vought Aircraft in Dallas, Texas for two years as test engineer in the structures test lab, and upon leaving Chance-

(Testimony of George Petoff.)

Vought I accepted a position with the University of Wichita Foundation for Industrial Research as a research engineer.

Q. What are your duties at that institution?

A. My duties are to perform research in the mechanical engineering division, research on any projects that might come into the particular division of the research foundation.

Q. What projects have you worked on for that research foundation?

A. I have worked on the evaluation of air distribution systems, air outlets for air distribution systems, and have certified tests on wall heaters for the Coleman Company who had placed a project with the Research Foundation for that particular purpose.

Q. In other words, the Coleman Company employed the [470] Foundation and you happened to be the man that did the work for the Foundation?

A. That is correct, sir, they employed us as an organization.

Q. Are you familiar with the usual tests, efficiency, mode of operation, of the heaters that have been introduced in evidence here?

A. Yes, sir, I am. [471]

Q. Now, have you made any tests or comparisons of the various Coleman heaters?

A. Yes. I have tested the Coleman Model 67, 68 and 69 heaters.

Q. What were you testing them for?

A. To establish the operational characteristics

(Testimony of George Petoff.)

under normal operating conditions; and, well, those operational characteristics would include efficiency and input and output radiants.

Q. Have you tested any of the Holly furnaces?

A. I have performed some tests on the Holly furnaces.

Q. Are you familiar with the operation of both these furnaces? A. Yes, I am.

Q. Now, referring to Exhibit Z, there is up the back of the Coleman furnace, on the outside of the furnace and between the wall, there is always a space, is there not? A. Yes, sir.

Q. Now, does some of the air that is in that space leak into the economizer?

A. Yes, some of that leaks into the economizer, and a portion of it finds its way around the flange of the economizer and continues on up the wall between the outside of the economizer and the inside of the stud space.

Q. Now, have you made any tests of the Coleman heater [472] in which you sealed that space so that no air could flow up the back?

A. Yes, I have.

Q. And what were the results of that test?

A. I don't recall the exact figures, but I believe that the difference was in the order of one or two—no. A very small percentage. I don't remember the exact per cent difference in the economizer flow. It was pretty small.

The Court: By the "economizer flow," do you mean the volume of air emitted from the upper—

(Testimony of George Petoff.)

The Witness: Yes, your Honor, vent.

The Court: Upper grille?

The Witness: Upper grille.

Mr. Lyon: Will you mark this for identification?

(The exhibit referred to was marked as Defendant's Exhibit AP for identification.)

Q. (By Mr. Lyon): Have you made any official reports concerning these tests that you refer to?

A. With the stud space blocked?

Q. Yes. In comparison with it open the ordinary way. A. I have.

Q. I hand you a document which is marked Exhibit AP for identification, and ask you what that document is?

A. This document is a summation of test information that I have obtained on Coleman Model 67 heaters to be presented [473] at a steering committee meeting at the Coleman Company on November 16, 1953.

Q. Was this report made in accordance with this project that you stated the Institute was hired to do? A. Yes, it was.

Mr. Lyon: I will offer that document as Defendant's Exhibit next in order, as Defendant's Exhibit AP.

Mr. Christie: As long as it may be understood it is purely for the purpose of illustrating the witness' testimony. Your Honor, this was an ex parte test. We didn't see it. We have no knowledge of it and I think that ought to be made clear.

(Testimony of George Petoff.)

Mr. Lyon: I agree it was made by this witness, but I think it is material testimony.

The Court: Offered as part of his testimony on direct examination, is that it?

Mr. Lyon: That is right.

The Court: Very well. Any objection to that?

Mr. Christie: No objection.

The Court: It may be received in evidence.

(The exhibit referred to was received in evidence and marked as Defendant's Exhibit AP.)

[See Book of Exhibits.]

Q. (By Mr. Lyon): Now, would you explain to the court what this report is, a quick summary of what this report is, Exhibit AP? [474]

A. All right. I would like to outline the test procedure and the test—the test points or the particular information we were looking for, first.

Q. If you would, please.

A. We were asked to determine how much, if any, of the total economizer flow could be contributed to the stud space, the rear stud space behind the Model 67 heater.

Q. Was this with a 4-foot or 3-foot economizer?

A. This was with the 4-foot economizer.

Our preliminary smoke test showed that particular flow up the rear stud space was not measurable by ordinary methods; not measurable by any methods which would assume any space in the rear of the heater, since that might upset the normal operating conditions there.

The Foundation devised a smoke generator com-

(Testimony of George Petoff.)

posed of a length of pipe, some cloth stuffing and fuel oil. This was ignited and tied to an air supply so that the amount of smoke could always be turned on and off at the convenience of the operator so that the room wouldn't get completely filled with smoke if we didn't need it. This particular type of smoke was introduced at the bottom of a Coleman Model 67 heater. [475]

Q. Through the ordinary intake of the heater?

A. That is correct, through the ordinary intake.

And the puffs of smoke up the back were observed, and an even flow of smoke up the back was observed. This smoke took a pretty definite pattern along the center of the back of the heater. It started out covering nearly the full width of the stud space at the bottom—I will make that, it did cover the whole width at the bottom, and converted to a fairly small width at the junction of the economizer and the lower heater in the Model 67.

The smoke was readily observable, and it was possible for me to time this smoke travel in a given distance along the back, and to determine the exact area through which it was flowing. I was able to combine the area with the velocity to obtain an air flow in terms of cubic feet per minute.

Q. You had a glass wall, did you not, in this tests so that you could see into this space?

A. That is correct. That wall served actually a dual purpose. It was the smoothest possible wall we could use, and also transparent so we could observe our results.

(Testimony of George Petoff.)

This particular test showed that approximately 85/100 of a cubic foot a minute of air was flowing up behind Model 67 lower heater, and the total discharge of the economizer was measured by two separate unrelated methods and determined to be approximately 20 cubic feet per minute. Therefore, the [476] amount of flow going up behind the heater contributed a ratio of 85/100 to 20, or a percentage of about four and a quarter of the total flow out of the economizer.

Actually this figure is not correct, because some of the flow going up the back also spilled out over the flange in the four-foot economizer, that is Plaintiff's Exhibit 24-B, and went on up the stud space into the attic. Therefore the percentage was somewhat less than the four and a quarter per cent that I just mentioned.

The Court: What is the percentage?

The Witness: Percentage of the total flow contributed by——

The Court: Out of the upper——

The Witness: Vent, yes, your Honor.

Q. (By Mr. Lyon): What does this report show as to the effect of the over-all efficiency of the Coleman 67 heater with the four-foot economizer, with the back sealed off so that no air could come up, in comparison with the efficiency of the same——

A. We were unable to detect on our instruments any difference in efficiency, in heater efficiency, with the stud space blocked or unblocked.

(Testimony of George Petoff.)

Q. Now, were those tests made in the same way that they make the efficiency tests for the A.G.A.?

A. Yes, they were. [477]

Q. Could you give the exact figures with it unblocked and with it blocked from that report?

A. The efficiency was measured twice with the rear stud space unblocked. The first test showed an efficiency of $71\frac{1}{2}$ per cent, the second showed $72\frac{1}{2}$ per cent. The efficiency with the rear stud space blocked was $72\frac{1}{2}$ per cent.

Q. Now, have you made any tests of the Holly furnace with the rear stud space blocked?

A. Yes, I have.

Q. And what were the results of those tests?

A. I remember the particular test that I conducted revealed an increase in the temperature of discharged air at the top vent of the Holly heater with the rear stud space blocked, over that which would occur there under unblocked conditions.

Q. Did you have an increase in temperature in the blocked condition on the Coleman heater in the tests you made? A. No, I did not.

Q. Have you made a report setting forth the facts that you determined on these tests?

A. Yes, I have.

Mr. Lyon: Will you mark this please.

Mr. Christie: We have the same comments to make with respect to these reports, your Honor. They cover work which [478] was conducted ex parte. Plaintiff didn't witness the tests. And we

(Testimony of George Petoff.)

suggest that they be admitted simply as illustrative of the present witness' testimony.

The Court: They are part of the testimony on direct, I take it, when they are offered.

Are you offering this last exhibit?

Mr. Lyon: As soon as I identify it, your Honor. I haven't as yet.

Q. (By Mr. Lyon): I hand you a document marked AQ and ask you if that is the report that you just testified to. A. Yes, it is.

Mr. Lyon: I will offer that in evidence, your Honor.

The Court: Received in evidence as Exhibit AQ—is that it, Mr. Clerk.

The Clerk: Yes, AQ, your Honor.

(The document referred to, marked Defendant's Exhibit AQ, for identification, was received in evidence.) [See Book of Exhibits.]

Q. (By Mr. Lyon): Has the Foundation for Industrial Research been asked to run—secure data on the difference between the Coleman four-foot and the Coleman three-foot?

A. Yes, I conducted those tests.

Q. You conducted those tests? A. Yes.

Q. Did you write a report on it?

A. I did. [479]

Mr. Lyon: Will you mark that as the next one, please?

(The document referred to was marked Defendant's Exhibit AR, for identification.)

Q. (By Mr. Lyon): What did you find out in

(Testimony of George Petoff.)

the comparison between these two types of economizers?

A. I could not detect an appreciable difference in the operating characteristics of the two different systems, one with the stud space blocked and the other with the stud space free.

Q. I will hand you a document marked AR and ask you if that is the report you just referred to?

A. It is.

Q. I notice that the title of this report is Special Report On Wall Heater Investigation—Comparison of Coleman No. 67-3101 and No. 68-A 3101; could you explain what those numbers are?

A. Yes. The 67-3101 is the four-foot economizer, similar to Plaintiff's Exhibit 24-B, and the 68-A 3101 is similar to Plaintiff's Exhibit 25-A.

Q. Those are the factory control numbers that they use on these? A. Yes.

The Court: One is the four-foot economizer and the other is the three-foot, I take it?

The Witness: Yes. [480]

Mr. Lyon: I will offer this as Defendant's Exhibit AR.

The Court: Received in evidence.

(The document, marked Defendant's Exhibit AR, for identification, was received in evidence.)

[See Book of Exhibits.]

Q. (By Mr. Lyon): From your study and work in compiling these reports of Coleman heaters, Mr. Petoff, what is your opinion as to the value, in the

(Testimony of George Petoff.)

operation of Coleman heaters, of air circulating outside of the lower box, and between the wall and the box?

A. Would you repeat that, please?

The Court: Please read it, Mr. Reporter.

(The question was read by the reporter.)

The Court: If you have an opinion.

The Witness: I would say that the air moving up behind the lower box and rear wall has a very small effect on the operation of the economizer, as compared with the air that can be drawn in from outside of the heater itself through the upper grilles.

Q. (By Mr. Lyon): By those upper grilles you mean 7 and 8 on Exhibit 24——

A. The grilles numbered 7 and 8, yes.

Q. On Exhibit 24-A?

A. Yes. And my test results show that this contribution of the rear stud space is only four per cent or slightly over four per cent of the total amount in the economizer. [481]

Q. What is the effect on the efficiency?

A. There was no detectable effect on the efficiency.

Mr. Lyon: That is all, your Honor. [482]

Cross Examination

Q. (By Mr. Christie): Mr. Petoff, you testified, I believe, that you got out of college in 1951.

A. That is correct.

Q. And you worked for Chance-Vought Aircraft for a couple of years?

A. Yes.

(Testimony of George Petoff.)

Q. Did that involve any work on wall heaters?

A. No, it didn't.

Q. Since you have been with the Wichita Research Foundation, have you worked on other projects that had no concern with wall heaters?

A. I have worked on other projects. I wouldn't say they had no concern with wall heaters. I have always worked with some type of heating equipment since I have joined the Research Foundation.

Q. So that you have worked continuously on wall heaters of the type that is involved in the suit here since you went with the Wichita Research Foundation?

A. No.

Q. What percentage of your total time would you have been employed on wall heaters of the type here in suit?

A. I would say just a little better than half.

Q. So your total experience on wall heaters of the type [483] we are talking about is probably about a year; would this be a fair summation of your testimony?

A. No. My total experience, I suppose, lumped into one sum, might be one year. But——

Q. Spread over two years?

A. Well, say—yes, wall heaters as such, I would say two years.

Q. Wall heaters, all wall heaters, including wall heaters of other than this type; and about one year on the type that we are talking about here?

A. No. I can't say that it's only one year on

(Testimony of George Petoff.)

this type. I started working on these a good deal longer than a year ago.

Q. Now, you testified just now that you had worked for the Wichita Research Foundation for about two years—— A. All right.

Q. ——and that a good deal of that time had been used on heating equipment; is that correct?

A. Yes.

Q. Now, you testified that part of that heating equipment was not wall heaters; isn't that right?

A. Yes.

Q. Do you know how much or what percentage of your total time was involved in other types of heating equipment? A. About half. [484]

Q. About half? A. Yes.

Q. So now we have half of two years working on wall heaters, is that correct? A. Yes.

Q. And that according to my mathematics is about a year total time.

A. I would say that I have worked on wall heaters and other types of heating equipment for two years each.

Q. But you have only been employed by the Wichita Research Foundation for two years——

A. Two years.

Q. ——isn't that correct? A. Yes.

Q. And you testified that you didn't do anything with wall heaters when you were with Chance-Vought, is that correct? A. Yes, sir.

Q. All right.

A. Well, I don't completely forget about all the

(Testimony of George Petoff.)

work I have done with a particular—on a particular test just because I happen to work on a different type of test. If I started two years ago working with a wall heater, then for two years now I have been concerned with wall heaters. And if I worked with a furnace two years ago, then for two years I [485] have been concerned with a furnace.

Q. Does this mean that you worry about your work, Mr. Petoff?

A. Occasionally I certainly do.

Q. Mr. Petoff, you have testified that you ran tests with the Coleman heaters equipped with the 3-foot and 4-foot economizers with this space blocked off at the back, is that correct?

A. Yes.

Q. Now, did you block off the space between the studs and the lower box on the sides?

A. No, I did not.

Q. So that there was still room for air to go up from behind around the lower box into the economizer, isn't that correct?

A. Not absolutely. On the 4-foot economizer there are four vent holes in the base plate of that economizer, and that air is just as free to go up the stud space between the economizer and the wall as it would be to go into the economizer.

Q. Now, you also testified that you ran tests on the Holly heater. By that I am referring to Exhibits 20, 20-A, 20-B, seriatim. Is that correct?

A. Yes.

(Testimony of George Petoff.)

Q. And you did that with the wall space behind the box [486] blocked? A. Yes.

Q. Now, did you block the space back of the sides? A. No.

Q. On that heater? A. No.

Q. So that there was still room for air to go up around the outside of the box into the heater exchanger, isn't that correct? A. Yes.

Q. Now, when you blocked the back of the wall space behind the 3-foot—behind the Coleman furnace equipped with the 3-foot economizer, where did you put that block?

A. I don't recall doing it with a 3-foot economizer.

Q. You didn't do it with a 3-foot economizer?

A. No.

Q. You have testified, have you not, that you compared the 3-foot and the 4-foot economizers with respect to this very function?

A. No. I have testified that I have compared the operation of the Coleman 4-foot economizer with stud space blocked and stud space free.

Q. You never did this with the 3-foot economizer? A. I don't recall doing it.

Q. So you don't know what happens to the temperatures [487] behind the lower box when you block off its communication with the economizer, isn't that correct?

A. Would you repeat that, please?

Mr. Christie: Would you read the question?

(Question read.)

(Testimony of George Petoff.)

The Witness: I have never measured those temperatures.

Q. (By Mr. Christie): You never measured them? A. No.

Q. You don't know whether that temperature would go up or down?

A. I assume it would go up.

Q. Have you any idea how much it might go up?

A. No.

Q. Now, you testified that you made certain smoke tests in which you observed a pattern of black smoke—— A. Yes.

Q. ——which you let go up behind the lower box of the Coleman furnace equipped with the 4-foot economizer, isn't that correct?

A. Yes.

Q. And then you observed puffs of smoke that you released behind the lower box and timed these puffs of smoke?

A. Actually those weren't released as puffs. Those were—smoke was introduced into the system from the normal air entrance in a steady stream. The smoke was ejected in a [488] path 90 degrees to the normal entrance so that the suction created by the burner and the flue action of the heater was the only force bringing that smoke into the heater itself. And those weren't injected as puffs, but there were swirls in that smoke that were easily detectible and measurable as far as a velocity was concerned.

Q. Now, what sort of smoke did you use?

(Testimony of George Petoff.)

A. I used an oil smoke.

Q. Now, were those oil smoke particles heavier than air?

A. I never saw a deposit, a carbon deposit, in any of the components in the furnaces where I used the oil smoke, so I would assume, no, that those particles were not heavier than air.

Q. How did this smoke differ from ordinary oil smoke?

A. I couldn't see any difference in smoke. It was a dense black smoke.

Q. Now, within your personal experience, haven't you found that particles of oil smoke settle out?

A. Yes.

Q. Now, so that these particles then would be heavier than air, isn't that correct?

A. They can be, depending on the temperature of the smoke and the air.

Q. Now, did you make any correction in your calculation [489] of velocity for the fact that smoke particles tend to settle out?

A. I did not. In order to be on the conservative side, the smoke itself was a good deal lighter than air, as evidenced by a rise in the smoke when it was near the floor.

Q. What do we mean by "smoke," Mr. Petoff? Do you mean the solid particles, or do you mean the gas, or do you mean the mixture of solid particles and gas?

A. I mean the mixture.

Q. Now I am talking about the mixture, too.

(Testimony of George Petoff.)

And isn't it true that the solid particles present in that smoke were heavier than the gas in which the solid particles were suspended?

A. I am not sure. If that were true, I would have seen a carbon deposit on the components of the furnace. And I saw no such deposits. I can't answer.

Q. None at all?

A. I would say no, that it would not be heavier than air.

Q. How about carbon tetrachloride, isn't it heavier than air? A. I don't know.

Q. Have you ever observed carbon tetrachloride settling out in your heater tests?

A. No, sir, I have not. I never used carbon tetrachloride. [490]

Q. I am sorry. I mean titanium tetrachloride and titanium dioxide, which develops as a fuel when you use titanium tetrachloride.

A. I haven't noticed any pronounced settling out of the titanium dioxide and hydrochloric acid. I have seen streaks along the glass back panel of our test wall that were attributed to the titanium tetrachloride smoke method. So there was settling out there.

Q. Now, you said that you detected a smoke pattern going up the back of the heater which did not include the total space around the sides and back of the lower box, is that correct?

A. Yes. I didn't see smoke in those other parts that you just mentioned.

(Testimony of George Petoff.)

Q. Now, in your computations you assumed, did you not, that all of the air was traveling in the space in which you observed the smoke pattern?

A. Yes.

Q. And you assumed that no air and no movement was going in the balance of the space, is that correct?

A. That is correct, yes.

Q. So that if there was air movement around, up the sides of the heater and in the space where you didn't observe the black smoke, the so-called smoke pattern, your calculations [491] would be wrong, isn't that correct?

A. If there were flow there, it would be wrong.

Q. Yes.

A. Yes. That is right. They would be wrong if there is flow there.

Q. And your entire testimony would then be worth very little?

A. That is not for me to decide.

Q. If carbon particles in smoke are heavier than gas in which they are included at the same temperature so that they tend to settle out, what you would observe by observing the smoke would be a net velocity, would it not, of the gas, minus the falling velocity of the smoke particles?

A. I believe maybe the net would go in the other direction. [492]

Q. Do you mean particles fall up, Mr. Petoff?

A. The smoke being lighter than air, yes, then particles would fall up.

Q. I think you misunderstood my question. I

(Testimony of George Petoff.)

say, let us assume that the smoke particles and the gas are at the same temperature, that is a fair assumption, is it not?

A. No. This smoke was produced by very hot flame, and the smoke started with a good deal higher temperature than the air going into the heater, and was therefore lighter than the air going back up.

Q. Tell me what you mean by the smoke. Are you talking about—

A. The mixture.

Q. The mixture?

A. Yes.

Q. I am talking about the gas that is in that mixture and the solid particles that are in that mixture. Let us assume that those solid particles are heavier than the gas, isn't it true, then, that they would tend to fall out?

A. Yes.

Q. Now, isn't it also true that if you watched a smoke particle or a body of smoke under those conditions, that what you would see as the smoke rose is the difference between the total velocity of the smoke and the velocity of the particles as they were falling out? [493]

A. Yes, it would.

Q. Did you make any corrections in your calculations for any such possibility?

A. No, I didn't.

Q. You were present, were you not, at the tests which Mr. Hoegh and I attended at Wichita?

A. Yes, I was there.

Q. Did you use the oil method that you have testified to this morning at those tests?

A. No, sir, we did not.

(Testimony of George Petoff.)

Q. Were we present, Mr. Hoegh or myself or anybody representing the plaintiff, during the tests about which you have testified this morning?

A. No.

Q. You testified that you measured the total output of the upper grille? A. Yes.

Q. During the tests about which you talked this morning. A. Yes.

Q. Is that correct? A. That is correct.

Q. Now, during the tests which were observed by the plaintiff's representatives in Wichita, did you make any such tests to show what the total volumetric output of the upper [494] grille of the economizer was?

A. I believe we offered to do that, Mr. Christie, and were told not to.

Q. By whom?

A. I don't recall. I remember we had made the offer, and received a reply to the effect that it wasn't necessary at that time.

Q. Did I tell you that?

A. I don't remember.

Q. Did any representative of the plaintiff tell you to do that? A. I don't remember.

Q. Well, who did, then?

A. I do know that we were asked not to do it.

Q. Do you think the Coleman Company asked you not to do it? A. No.

Q. You don't remember who told you not to do it?

Mr. Lyon: Your Honor, that matter that he is

(Testimony of George Petoff.)

now asking about is in the deposition. If he cares to read it he will find out who told him not to.

The Court: Which deposition do you refer to?

Mr. Lyon: To the deposition of Mr. Blazier, where the offer was made to make these tests and plaintiff's counsel stated that they didn't need the tests made. [495]

The Court: Referring to Exhibit Q?

Mr. Lyon: I would have to look at the exhibit to see, your Honor. Mr. Petoff has my list of exhibits.

The Witness: That is Q, Mr. Lyon.

Mr. Lyon: Thank you.

Mr. Christie: May I have Exhibit R, Mr. Clerk?

Q. (By Mr. Christie): Now, Mr. Petoff, I call your attention to a diagram marked "Drawn by GLP," which appears in Exhibit R; it is further identified as "Diagram of smoke pattern along glass back wall of Coleman Model No. 67 heater"; are those your initials? A. Yes, they are.

Q. Did you make this drawing?

A. I made the original from which this was copied, yes.

Q. And is this black pattern, this black portion up the center of the drawing, what you mean by the smoke pattern?

A. That is my representation of what I saw along the back of that heater.

Q. And it is your contention, and it was your assumption in the calculations that you made, that the only gas movement up the back of the heater

(Testimony of George Petoff.)

was in the portion that is marked in the dark, is that correct? A. Approximately, yes.

Q. How wide would that be in terms of inches?

A. I don't recall right now what that width was.

Q. I call your attention, Mr. Petoff, to another drawing which is on a piece of graph paper. Again I see the initials GLP, this is in Exhibit R—is that your drawing?

A. Yes, that is a copy of an original I had made. Those are not my penciled notations.

Q. I understand that.

These pencil notations, your Honor, were put on, I believe, during the depositions at Wichita.

But the notation "Outline of smoke pattern" is yours, is it not?

A. Yes, it is.

Q. I notice at the bottom, at a point marked A on the drawing, that you marked it 5.6 inches, is that correct? A. Yes.

Q. And I notice that at the top adjacent the point marked B you marked 3.2 inches?

A. Yes.

Q. This was your estimate of the width of the smoke pattern, was it not?

A. At those two points?

Q. Yes. A. Yes, it was.

Q. And you assumed that it tapered in a straight line, which you have marked "Outline of Smoke Pattern," between those two points? [497]

A. I observed this particular type of smoke pattern, and those straight lines would not be the

(Testimony of George Petoff.)

actual outline of the smoke, they would be the envelope around the smoke, that would be the farthest out the smoke could be.

Q. In your work, Mr. Petoff, did you not consider—and in your calculations about which you have testified this morning—did you not consider that this tapering portion which you have marked “Outline of Smoke Pattern” was, in effect, a chimney, and that this was the only place in which gas movement occurs behind the heater?

A. Yes.

Q. And that, again, would be a rather narrow space 5.6 inches at the bottom and 3.2 inches at the top?

A. Yes.

Q. Mr. Petoff, these tests that you have described this morning are the basis of Mr. Blazier’s testimony yesterday in which he said that only four per cent of the gas coming out of the upper grille of the Coleman economizer was contributed by gas going up the back and sides of the heater, is that correct?

A. I believe so.

Mr. Christie: That is all, your Honor.

The Court: Did you make a test of the relative efficiency of the Holly heater with the air from the back and sides of the lower box blocked off? [498]

The Witness: No, your Honor, I did not compare the efficiencies.

The Court: Do you attach any significance to the fact, as I understood it, that the smoke traveling up the back of the lower box of the Coleman

(Testimony of George Petoff.)

heater came to an apex or a near apex at about the junction of the lower box with the economizer?

The Witness: Yes, your Honor. That apex showed that the warmest spot on the back of the heater, which contributed to a chimney action, was right at about that point, right at the junction of the lower and the upper boxes. * * * * *

Redirect Examination

Q. (By Mr. Lyon): I believe you testified that when you blocked the back of the Holly heater the temperature in the secondary heater rose appreciably? A. Yes.

Q. Now, why didn't you measure the efficiency, then, of that heater like you did with the Coleman?

A. I don't recall the exact reason why the efficiency wasn't measured at that time. I believe that there was more [499] significance attached to the temperature rise in the structure surrounding the secondary heat exchanger and the delivery air of the secondary heat exchanger, and just did not conduct a——

Q. What happens to the efficiency of a heater when the stack temperature rises sharply?

A. If stack temperature rises sharply the heater efficiency will decrease. There is just not as much opportunity for heat transfer from that stack.

The Court: Why would that be so?

The Witness: The higher the temperature of a given radiator the greater the heat transfer, and in the surrounding structure if the temperature of

(Testimony of George Petoff.)

that structure is high, then the temperature difference on which radiation works will be less.

The Court: I understand that, but I understood you to say that the higher the temperature of the economizer the less heat would radiate from it.

The Witness: The higher the temperature of the economizer, then the greater the flue loss, the heat loss in the flue. Actually the heat transfer will be higher, but the high temperature in the flue itself means that heat is lost up that flue.

The Court: When you spoke of the increased temperature in the Holly heater, in the economizer of the Holly heater, when the circulation of the air from behind the heater and [500] along the sides of the lower box was blocked off, were you speaking of flue temperature, or the economizer?

The Witness: Flue temperature would necessarily have to be higher in order for that air to be warmer. So then the efficiency would be lower.

The Court: Was any attempt made to measure the temperature, increase in temperature, if any, behind the lower box of the Holly heater, when the passage of air was blocked off?

The Witness: I recall measuring the outside of the glass wall, but not the inside, your Honor, and I did notice a slight increase in temperature when the rear stud space behind the Holly heater was blocked.

The Court: Did you make that same observation with respect to the Coleman heater?

(Testimony of George Petoff.)

The Witness: Yes, just a qualitative type of test. I did not actually measure it quantitatively.

The Court: Did you make any note of a comparison in that regard between the two, the Coleman and the Holly?

The Witness: A comparison——

The Court: With regard to how the heat temperature increased behind—the temperature of the glass behind the lower box?

The Witness: No, I did not, your Honor.

Mr. Lyon: I have nothing further, your Honor.

Recross Examination

Q. (By Mr. Christie): You mentioned that the temperature in the flue would necessarily increase if the stud space was blocked off, I believe you said.

A. No, I said that if the air surrounding the flue were warmer—if a given operating condition were established in the heater, and suddenly the ventilation space around the flue, the air in that ventilation space were heated to a greater degree than it had been during the normal operating condition, then the flue temperature necessarily must be higher.

Q. Did you measure that flue temperature?

A. No, I did not.

The Court: That is to say that if there is one pipe around another pipe, and the outside pipe is hot, the inside pipe will be hotter, is that it?

The Witness: If the outside one was hotter than

(Testimony of George Petoff.)

it was during the normal operating condition, then the inside one will be hotter, also, yes, sir.

The Court: Does heat flow more rapidly from a hot object to a very cold object than it does from a hot object to a lukewarm object?

The Witness: Yes, your Honor, the heat transfer by radiation is a function of a fourth power.

The Court: Is it correct to say that heat flows?

The Witness: Yes.

The Court: Is that correct?

The Witness: Yes. Function of the fourth power, the absolute temperatures of the two different objects, so that an increase in the colder object would necessarily cut down or reduce the heat transfer from the warmer object.

The Court: That is the rate of transfer?

The Witness: The rate, yes. * * * * * [503]

The Court: Do you offer it in evidence?

Mr. Hoegh: Plaintiff's Exhibit 16 in evidence.

The Court: It may be received in evidence.

(The document referred to was received in evidence and marked as Plaintiff's Exhibit No. 16.) [See page 517.]

Mr. Hoegh: The other letter is dated February 23, 1954, addressed to Mr. Stanley Johnson, president of the Holly Manufacturing Company.

The Court: Is it stipulated that that letter was sent by Mr. Hoegh on or about the date it bears to the addressee therein named? [504]

Mr. Lyon: If Mr. Hoegh so states, I will so stipulate.

Mr. Hoegh: I do, your Honor.

This letter to Mr. Johnson points out that I took steps to call Mr. Lyon with regard to this article that appeared to inform him of the action we were taking to get a retraction published.

The Court: Exhibit 15 for identification?

Mr. Hoegh: 15 for identification, yes, sir.

The Court: It may be received in evidence.

(The document referred to was received in evidence and marked as Plaintiff's Exhibit No. 15.)

[See page 517.]

* * * * *

Mr. Hoegh: I want to read into the record at this time some very short portions from the testimony of Mr. Coleman on page 28 of the deposition taken in Wichita, Kansas, on April 6, 7 and 8, Plaintiff's Exhibit 9 for identification, beginning the eighth line up from the bottom of the page.

Mr. Christie is questioning Mr. Coleman.

"Q. Did you have what is known in the industry as a 'hot wall' problem? [505]

"A. I can't answer that. I don't know what you mean. You are always fighting temperatures in any heating device."

Mr. Lyon: What page is this, please?

Mr. Hoegh: 27.

Mr. Lyon: You said 28.

Mr. Hoegh: Page 27, Mr. Reporter; eight lines from the bottom.

"Q. I mean the wall above the wall heater, did that give you trouble, get too hot?

"A. I assume that is probably correct because it is a traditional problem."

I would like to turn now to the deposition of Mr. Kice on page 115 of the deposition, four lines from the bottom. [506]

The Court: Is that the same Exhibit 9 for identification?

Mr. Hoegh: Yes, sir.

Mr. Christie was examining Mr. Kice:

"Q. Have you had anything to do with the testing of wall heaters?"

I will correct that, your Honor. Mr. Hoegh is examining Mr. Kice.

"Q. Have you had anything to do with the testing of wall heaters?"

"A. Not in the laboratory.

"Q. Have you set up test requirements; have you told people that you would like to have shown?"

"A. Only in connection with the patent litigation we are now in.

"Q. Would that be here in the plant as well as other places?"

"A. No, only at the Foundation for Industrial Research.

"Q. What instructions did you give the Foundation when you wished to have certain tests made, referring to the tests on Coleman and Holly wall heaters?"

"A. It seemed to me that the matter to be tested was the one pertaining to the amount of [507] leakage that occurred in connection with this ventilated stack which we were able to set up tests

that would determine the degree of leakage, and in order to measure it we first had to make some rather unusual preparations to determine the techniques and procedure for measuring the small quantities involved. It wasn't possible to measure this with the normal techniques we had in our own laboratory—we used a kind of a tracer arrangement by carbon dioxide.”

I ended at the seventh line from the bottom on page 116.

I would like to turn now to page 117, the eighth line from the top:

“Q. Did you decide the type of wall construction that would be used?

“A. Yes, it was my decision.

“Q. Did that include the type of lathing that was used?

“A. We set up what we felt would give the worst possible situation and the best possible situation from this leakage standpoint.”

* * * * * [508]

PAUL HARVEY HAMMOND

called as a witness by and on behalf of the plaintiff, in rebuttal, having been first duly sworn, was examined and testified as follows:

The Clerk: Please state your name.

The Witness: Paul Harvey Hammond.

The Clerk: H-a-m-m-o-n-d?

The Witness: That is correct, sir.

Direct Examination

Q. (By Mr. Christie): Mr. Hammond, will you state your age, residence?

A. I am thirty-nine years of age and reside at 1135 Linda Vista in Pasadena.

Q. What is your present occupation?

A. Vice-president and controller, Holly Manufacturing Company.

Q. How long have you had that position?

A. The title of controller was added in May of this year. I had been vice-president of the company since 1947.

Q. As vice-president what have been your duties?

A. I have been generally in charge of the administrative affairs of the company dealing with accounting, budgets, [510] what we term control reports, which consist of the internal reports for control of our own company operations, material procurement, and I have, also, in a staff capacity, determined the level of operations for the company, that consisting of evaluating our availability of material, plant capacity, man-power, financial and all of the other things that would go into determining

(Testimony of Paul Harvey Hammond.)

the volume at which we produce in evaluating our sales potential against that.

Q. Does your job include supervision of the accounting department of Holly Manufacturing Company? A. Yes, sir, it would.

Q. How long have you supervised the accounting department? A. Since 1946.

Q. Are you familiar with the accounting and sales records of the company?

A. Yes, sir, I am.

Q. Since when?

A. Since the same date, 1946.

Q. When did you first come with Holly Manufacturing Company?

A. I was employed in 1940, became secretary of the corporation when it was incorporated on December 17, 1945.

Q. Did you remain in that position until 1947?

A. That is correct, sir. [511]

Q. Would you tell me what your education is?

A. I have a Bachelor of Science degree in engineering from Caltech.

Q. When did you get that degree?

A. That was in 1936.

Q. What did you do in the interval between 1936 and 1940 when you testified you came to work for Holly Manufacturing Company?

A. I was employed by the Southern California Gas Company as a commercial representative.

Q. Are you familiar with the products of the company? A. Yes, I am. [512]

(Testimony of Paul Harvey Hammond.)

Q. I call your attention to Plaintiff's Exhibits 20, 20-A, 20-B, and ask you if you know what that is.

A. Yes, sir. That is our so-called new model wall heater, with the secondary heat exchanger.

Q. Do you know when you first began manufacturing that?

A. That was first manufactured and sold in 1950.

Q. About what month, if you know?

A. August of 1950.

Q. Had Holly manufactured wall heaters prior to that time?

A. We had, but without the secondary heat exchanger.

Q. Now, do you know what happened when you introduced your new model with the secondary heat exchanger, identified by Exhibits 20, 20-A, 20-B?

A. Our volume of wall heater production, sales, orders, back log, all increased substantially in the intervening period of time.

Q. Did you continue to manufacture the old type wall heater?

A. No, that was discontinued as rapidly as we were able to stock and deliver the new model.

Q. Now, since August 1950 have you manufactured any wall heaters other than those exemplified by Plaintiff's Exhibits 20, 20-A and 20-B?

A. There was a short transition period in which we continued to produce some of the old wall heaters, but as rapidly as the new design became available, conversion was made, and by the end of that

(Testimony of Paul Harvey Hammond.)

period—by the end of 1950 we completely ceased manufacture of the old style heater.

Q. Have you made an examination of the company's records to discover the number of wall heaters that you shipped beginning in 1950 to 1954?

A. Yes, I have.

Mr. Christie: Your Honor, I have certain original records here. They are the file records of Mr. Hammond, and I would like to substitute a photostatic copy, subject to Mr. Lyon's right to examine them, and subject to error, if any appear.

The Court: Have these documents been marked for identification?

Mr. Christie: I am about to have them marked, sir, as Plaintiff's Exhibit 34-A for identification.

The Clerk: This is one exhibit?

Mr. Christie: This is one exhibit.

(The documents referred to were marked Plaintiff's Exhibit No. 34-A for identification.)

* * * * * [514]

Q. (By Mr. Christie): Mr. Hammond, I hand you a group of papers which have been marked Plaintiff's Exhibit No. 34 for identification, and I ask you to tell me what they are, and your familiarity with them.

A. These records are what we term our "Status Report." You will notice there is a change in title for the year 1954 where we refer to it as a Monthly Model Report." But essentially these records show our production, orders, shipment and back log on a weekly basis, and then cumulatively [515] for the

(Testimony of Paul Harvey Hammond.)

year. And the particular reports which I have are the ones for the last week of the year. Therefore, a cumulative report showing our total back log and shipments for the year.

Q. Are these records kept in the regular course of business of the Holly Manufacturing Company?

A. Yes, sir, they are.

Q. Are you familiar with them?

A. Yes, I am.

Q. Have they been prepared under your supervision and control? A. They have been.

Mr. Christie: I offer them in evidence, your Honor, as Plaintiff's Exhibit No. 34-A.

* * * * * [516]

The Court: His statement is this: You set out to keep a record—I don't care what you call it; it is a record. Now, are you offering the complete record of the record which is being offered?

The Witness: Yes, I am. [517]

The Court: Complete unit?

The Witness: That is correct.

The Court: Its integrity has not been disturbed by dividing it——

The Witness: No, sir. This is a record we have maintained quite independently from any consideration of this case for a number of years; in fact, they date back prior to the years that are offered here. They are complete in that they show units.

The Court: Is it the ordinary course of the business of your company to keep such a record?

The Witness: It is, sir.

(Testimony of Paul Harvey Hammond.)

The Court: How long has that been so?

The Witness: I would believe that this has been kept at least since 1946, sir.

The Court: And is it accurately kept?

The Witness: Very accurately kept.

The Court: How is it compiled?

The Witness: It is compiled from various sources. We have our production records. They are used to compile the production figures shown here. The shipment figures come from the actual shipping form which we use in shipping merchandise out to the customer. The order portion comes from records maintained in the sales department, which is a journal entry, in effect, of orders as received. And then [518] the balance of the form is essentially computed from that data to show cumulative figures, as well as specific totals for periods of time. The particular record we are offering here is a cumulative record for the years in question.

* * * * *

The Court: The objection is overruled. The document will be received in evidence as Exhibit 34-A.

(The document referred to was received in evidence and marked as Plaintiff's Exhibit 34-A.)

[See pages 529-534.]

* * * * * [519]

Mr. Christie: May I have this second sheet marked for identification as Plaintiff's Exhibit next in order. I believe it is 35.

The Clerk: 35.

(Testimony of Paul Harvey Hammond.)

(The document referred to was marked Plaintiff's Exhibit 35, for identification.)

Q. (By Mr. Christie): Mr. Hammond, I hand you a document, which has been marked for identification as Plaintiff's Exhibit 35, and ask you to tell me what it is.

A. This is a computation sheet illustrating how we prepared a figure for total wall heater orders by units, received in each of the years from 1950 through '54.

Q. Where did you get the figures that you used in those computations?

A. These figures are derived directly from the reports [523] which have just been entered as evidence.

Q. Would you identify the exhibit, please?

A. That is the status reports which I have here.

The Court: Exhibit 34-A?

The Witness: Exhibit 34-A.

Q. (By Mr. Christie): Did you compile these figures yourself?

A. They were done under my direction, and I have checked them.

Q. You personally have checked them?

A. Yes.

Mr. Christie: I ask that this exhibit, which the witness has just testified about, be placed in evidence as Plaintiff's Exhibit 35.

The Court: Is there objection?

Mr. Lyon: Only that it isn't a complete record.

The Court: Is Exhibit 35 for identification, a

(Testimony of Paul Harvey Hammond.)

record kept in the ordinary course of business of the plaintiff?

The Witness: No, sir, it is not. This was a record that we made to clarify information appearing on the record which is normally kept in business. We have similar records to this, but not in this particular form.

Mr. Christie: Your Honor, this was done to save time. The witness could go through these records and take off from them—— [524]

The Court: What are “these records”?

Mr. Christie: Plaintiff’s Exhibit 34-A.

The Court: Was Plaintiff’s Exhibit 35 compiled from the data which appears in Plaintiff’s Exhibit 34-A?

The Witness: Yes, sir, in an attempt to clarify certain of the information shown thereon. I can run through the exact type of computation that we have on here, if it would help in illustrating the point.

Mr. Christie: Your Honor, I can take him through the computations based upon that, but it would take far more of the court’s time than is necessary. This was in an effort to expedite the proceeding.

The Court: What is the purpose of Exhibit 35?

Mr. Christie: It is to show, sir, the number of units of the heaters of the preceding model and of the model which we say is constructed in accordance with the invention, which were actually shipped from Holly’s plant, and constituted their actual out-of-the-plant production that went into

(Testimony of Paul Harvey Hammond.)

industry year after year beginning in the year 1950, when the model was introduced.

Mr. Lyon: If Your Honor please, since he has withdrawn the statement that they are records of the company, I have no objection to it going into evidence, with the understanding that this is merely what the witness would testify he was asked orally to set forth what Exhibit 34-A shows. [525]

The Court: Very well. For that purpose Exhibit 35, for identification, will be received in evidence.

(The document referred to, marked Plaintiff's Exhibit 35, for identification, was received in evidence.)

[See page 535.]

Mr. Lyon: Originally they made the statement that they were records of the company.

Mr. Christie: I don't believe any such statement was made.

The Court: Just direct your remarks to the court, Mr. Christie.

Mr. Christie: I am sorry, sir.

I ask that the document which has just been testified to, be marked as Plaintiff's Exhibit 35.

The Court: It has been received.

Mr. Christie: I ask that another document entitled Computation Holly Wall Heater Shipment Units be marked for identification as Plaintiff's Exhibit 36.

The Court: It may be so marked.

(The document referred to was marked Plaintiff's Exhibit 36, for identification.)

(Testimony of Paul Harvey Hammond.)

Q. (By Mr. Christie): Mr. Hammond, I ask you to identify the document which I have had marked for identification as Plaintiff's Exhibit 36; will you tell me what it is, who made it, and where the numbers appearing thereon were derived?

Mr. Lyon: Pardon me. I think we will save time. Isn't this a similar document to 35, just another compilation from 34-A?

Mr. Christie: Correct.

The Court: Is that correct?

Mr. Christie: Yes.

The Witness: It is identical with 35, except that it shows shipments.

Mr. Lyon: I have no objection with that understanding of what the exhibit is.

The Court: It is offered as part of the testimony of the witness.

Mr. Lyon: Of the witness, yes.

Mr. Christie: It is offered as part of the testimony of the witness, your Honor.

The Court: Very well. Received in evidence.

(The document referred to, marked Plaintiff's Exhibit 36, for identification, was received in evidence.)

[See page 535.]

Mr. Christie: In order to save time, then, I would like to offer the next one directly into evidence as Plaintiff's Exhibit No. 37. It is entitled "Computation Holly Wall Heater Back-log Units," with the same understanding.

(Testimony of Paul Harvey Hammond.)

Mr. Lyon: With the same understanding as Exhibits 35 and 36.

The Court: Was Exhibit 37, for identification, compiled [527] from Exhibit 34-A, Mr. Hammond?

The Witness: Yes, it was.

The Court: Received in evidence.

(The document referred to, marked Plaintiff's Exhibit 37, for identification, was received in evidence.)

[See page 536.]

Mr. Christie: To save time, your Honor, I would like to do the same thing with three more exhibits, which are simply graphs of the values which Mr. Hammond arrived at by the computations represented by Exhibits 35, 36, and 37.

Mr. Lyon: In other words, he would testify that this represents his testimony?

Mr. Christie: Exactly.

Mr. Lyon: I have no objection under that offer.

The Court: Have these documents been marked?

Mr. Christie: I would ask that the one entitled "Holly Wall Heater Orders" be marked as Plaintiff's Exhibit next in order. I believe it is 38.

The Clerk: 38.

The Court: It will be received in evidence as part of the witness' testimony, pursuant to the agreement.

Mr. Christie: The next graph——

The Court: The last one will be Exhibit 38, Mr. Clerk?

The Clerk: Yes, your Honor, 38.

(Testimony of Paul Harvey Hammond.)

(The document referred to, marked Plaintiff's Exhibit 38, for identification, was received in evidence.)

[See page 537.]

Mr. Christie: The next one offered in evidence as Plaintiff's Exhibit 39 is entitled, "Holly Wall Heater Shipments."

Mr. Lyon: I gather, 38, 39, and the next one, which will be 40, are all under this same agreement?

Mr. Christie: That is correct.

The Court: Exhibit 39, for identification, is received in evidence.

(The document referred to, marked Plaintiff's Exhibit 39, for identification, was received in evidence.)

[See page 538.]

Mr. Christie: The next one entitled "Holly Wall Heater Unfilled Order Back-log Units at End of Year," a graph, I ask be marked in evidence as Plaintiff's Exhibit 40.

The Court: Pursuant to the agreement it will be received.

(The document referred to, marked Plaintiff's Exhibit 40, for identification, was received in evidence.)

[See page 539.]

The Court: As I understand it, then, Mr. Hammond, Exhibit 38 is a graph representing the figures on Exhibit 35, Exhibit 39 is a graph representing the figures on Exhibit 36, and Exhibit 40

(Testimony of Paul Harvey Hammond.)

is a graph representing the figures on Exhibit 37?

I am sorry, I thought you had the exhibits before you. [529] Do you understand the question?

The Witness: Yes, I do, your Honor.

Exhibit 40 is unfilled orders and would pertain to Exhibit 36; Exhibit 39 on shipments follows Exhibit 35; and Exhibit 38 on orders would follow Exhibit 36.

The Court: The first one, Exhibit 40, the first one you mentioned, on the back-log, would follow Exhibit 37, would it not?

The Witness: 40 is Exhibit 37, yes, sir.

The Court: Very well.

Mr. Hoegh: Your Honor, if I may interrupt for a moment. We have a document here which we thought was Exhibit 34, and the clerk's listing didn't have it, so we started out with the company records of Holly this morning as Exhibit 34. It is on page 205 of the transcript.

The Court: You mean there had been previously—yes, according to my notes a sketch of an experimental heater with two louvres for circulation had previously been marked in evidence as Exhibit 34.

Mr. Hoegh: Yes, I had that, also.

Mr. Lyon: Yes, that's right.

Mr. Christie: Your Honor, could we avoid the confusion by having the exhibit, which is the records that Mr. Hammond has testified to as Exhibit 34, identified as 34-A? [530]

The Court: Is there any objection?

Mr. Lyon: No objection.

(Testimony of Paul Harvey Hammond.)

The Court: So ordered.

Mr. Lyon: And where Mr. Hammond has referred to an Exhibit 34, or Mr. Christie, or your Honor, or myself, this morning, the reporter should change it to 34-A?

The Court: Is that agreed?

Mr. Christie: That is agreed, your Honor.

The Court: So ordered.

(The changes ordered by the court of "34" to "34-A" were physically made by the court reporters.)

Q. (By Mr. Christie): Mr. Hammond, I call your attention now to Plaintiff's Exhibit 39 entitled, "Holly Wall Heater Shipments," and ask you if you prepared this graph, and if so, where you got the figures that are on the graph, and what the graph shows.

The Court: As I understood it, it was agreed that he prepared Exhibit 39 from the figures on Exhibit 36.

Mr. Christie: 34-A, sir.

The Court: And the figures on 36 came from Exhibit 34-A. Is that correct?

The Witness: That is correct, your Honor.

Q. (By Mr. Christie): Will you explain what Exhibit 39 shows?

A. I think Exhibit 39 shows the very marked increase in [531] our wall heater shipments, in 1950, when they were predominantly of the old style heater our total shipments were some 23,935, and in 1954 that figure has risen to 61,406.

(Testimony of Paul Harvey Hammond.)

The Court: Aren't these documents intended to speak for themselves?

The Witness: Yes, they really were.

Q. (By Mr. Christie): What would you say with respect to the showing on Plaintiff's Exhibit 38?

A. That one referring to back-log, I think again indicates the tremendous expansion of our wall heater business. That back-log increasing from——

The Court: Does Exhibit 38 refer to back-log?

Mr. Christie: 38, according to my notes, refers to orders.

Mr. Lyon: Your Honor, I thought that these exhibits were put in for the purpose of eliminating the necessity of his testifying.

The Court: Is there any occasion to go over it, Mr. Christie?

Mr. Christie: I was simply asking one question.

The Court: Don't they speak for themselves? I haven't examined the documents, but I assume that you can argue from them.

Mr. Christie: They speak for themselves.

Mr. Lyon: At least I can understand them.

Mr. Christie: Very well.

I would like to have marked in evidence as a group a series of documents from the Bureau of Census of the United States Government. The first one is entitled, "Heating and Cooking Equipment (Except Electric) 1951," and particularly Table 2 of that exhibit, as Plaintiff's Exhibit 41.

The Court: Is there any objection?

(Testimony of Paul Harvey Hammond.)

Mr. Lyon: No objection.

The Court: Is it stipulated to be genuine and in all respects what it purports to be?

Mr. Lyon: I have no idea, but I will accept it if he states they are.

Mr. Christie: I just want the one sheet, but we could put in evidence the entire document so that the court can see it is what it purports to be.

Mr. Lyon: If you make the statement, then we can go to the one sheet, so if it comes to a case of printing this record we won't have to print the whole document.

Mr. Christie: Very well, the single sheet, then.

The Court: What sheet is offered, then?

Mr. Christie: The sheet which is entitled, "Table 2," sir. I marked it with a check mark, and the clerk has marked it.

Mr. Lyon: I will accept a photostat if you want to put [533] that in.

Mr. Christie: That may save confusion, your Honor, if we just put the photostat in.

The Court: Very well. It will be received as Plaintiff's Exhibit 41 in evidence.

(The document referred to was marked Plaintiff's Exhibit 41, and was received in evidence.)

[See Book of Exhibits.] [534]

Mr. Lyon: Why don't you just put the whole stack bound together as one exhibit?

Mr. Christie: All right. I was going to mark them and identify the separate pages, but I will offer them all.

(Testimony of Paul Harvey Hammond.)

The Court: That is a series——

Mr. Christie: A series of pages from a successive group of U.S. Census Reports discussing heating equipment.

The Court: Stipulated to be genuine in all respects what they purport to be?

Mr. Lyon: That is right.

The Court: You offer them as one exhibit? Let them all be a part of Exhibit 41.

Mr. Christie: They will be a part of Exhibit 41.

The Clerk: Is this Exhibit 41 in evidence?

The Court: Yes, in evidence pursuant to agreement.

(The exhibit referred to was received in evidence and marked as Plaintiff's Exhibit No. 41.)

[See Book of Exhibits.]

Mr. Christie: A total of 13 pages, your Honor.

Q. (By Mr. Christie): I show you a group of pages from the U.S. Census Reports, Mr. Hammond, and ask you if you are familiar with them and have used them in any computations.

The Court: This is Exhibit 41?

Mr. Christie: Exhibit 41.

The Witness: Yes, sir, we do. Exhibit 41 is a bulletin put out by the Bureau of Census of the United States Department [535] of Commerce in which they show, among other things, national wall furnace shipments. And we used that to compare our own sales as against national figures to determine the percentage of the market that we enjoy.

(Testimony of Paul Harvey Hammond.)

Mr. Christie: I ask that a sheet marked "Computation Total National Wall Heater Shipment Units" be marked as Plaintiff's Exhibit 42 in evidence, under the same stipulation that we have heretofore had, that it represents a part of his oral testimony.

Mr. Lyon: Of his oral testimony.

The Court: Does this document represent a computation made by you from Exhibit 41?

The Witness: Exhibit 42 is a compilation from Exhibit 41 made under my direction to summarize wall furnace shipments.

The Court: Received in evidence, pursuant to the agreement.

(The document referred to was received in evidence and marked as Plaintiff's Exhibit No. 42.)

[See page 541.]

Mr. Lyon: This is one, your Honor, that I don't think is very helpful that way. I can't figure out what is intended. I am going to have to have some oral testimony on this one.

The Court: You are referring to Exhibit 42?

Mr. Lyon: That's right.

Mr. Christie: I will try to make it as brief as I can, [536] your Honor.

Q. (By Mr. Christie): Now, will you explain, very briefly, Mr. Hammond, what Exhibit 42 is and how you compiled it, and what information you used?

A. Exhibit 42 is a summary of Exhibit 41, at-

(Testimony of Paul Harvey Hammond.)

tempting to show national wall furnace sales. Calling direction to certain of the specific sheets in Exhibit 41, you will note that in the year 1950 there is no segregation made on the report between oil and gas wall furnaces, so that a single figure is given. In intervening years up to 1954 there was a breakdown between oil and gas wall furnaces and then again in 1954 individual report sheets show only a summary for oil and gas wall furnaces. So in order to use a comparable index throughout the entire period here, I have combined oil and gas wall furnaces as an addition in the years 1951, '2 and '3, so that those figures would be comparable to the only available figures for the years 1950 and '54.

Q. Now, Mr. Hammond, are these figures Holly's sales or are they national sales throughout the United States?

A. These are national sales.

Q. I am referring now to Exhibits 41 and 42.

A. Yes, sir. Those are national sales as reported by the Bureau of Census.

Mr. Lyon: Might I interrupt for one question? I might clear it up if I might ask the witness one question. [537]

Mr. Christie: Certainly, your Honor.

Mr. Lyon: And that is, Exhibit 42 are the sales of all manufacturers in the United States; this doesn't relate to Holly in any way, does it?

The Witness: That is correct. I could not answer that that it would include, represents this figure as

(Testimony of Paul Harvey Hammond.)
covering between 95 and 99 per cent of the annual production.

Mr. Lyon: Thank you. That was what was unclear. I didn't know whose sales these were by the document itself. I think it now speaks for itself.

Mr. Christie: I would like to have marked in evidence as the plaintiff's exhibit next in order, which I believe is No. 43, a compilation entitled "Data Illustrating Commercial Success of New Type Holly Wall Heaters," under the stipulation that I have had previously with Mr. Lyon.

Mr. Lyon: May I see just which one this is?

Mr. Christie: The stipulation to the effect that this is part of the witness' testimony.

The Court: Is this Exhibit 43 for identification a document prepared under your direction?

The Witness: Yes, your Honor, it is.

The Court: What is the source of the data contained thereon?

The Witness: This data would summarize material shown elsewhere on Exhibit 34-B through 42, your Honor. [538]

The Court: 34-A?

Mr. Lyon: I will make the same stipulation.

The Court: 34-A?

The Witness: I believe that was the first one introduced since I was testifying.

The Court: Yes.

Mr. Lyon: I will make the same stipulation. I think this one speaks clearly for itself.

(Testimony of Paul Harvey Hammond.)

The Court: Very well. Exhibit 43 for identification will be received in evidence.

(The exhibit referred to was received in evidence and marked as Plaintiff's Exhibit No. 43.)

[See page 542.]

Q. (By Mr. Christie): Would you tell me, briefly, Mr. Hammond, referring to the first column on the left, after the column entitled "Year" where you got the figures in that column? It is entitled "Total National Wall Heater Shipment Units."

A. That came from Exhibit 41, the Bureau of Census Reports on National Shipments of all manufacturers.

Q. Now, the next column entitled "Holly Wall Heater Shipment Units," where did you get those figures?

A. Those came from our own computations. The shipments came from Exhibit 36. The orders coming from Exhibit 35. And the back log figures from Exhibit 37.

Q. Now, the next column entitled, "Per Cent of National [539] Market"?

A. The per cent of National Market is a computation showing Holly wall heater shipments in units as a percentage of national wall heater shipments in units.

Q. For each year? **A.** That is true.

Q. Now, the next column, "Orders Units," where did those figures come from?

A. I believe I jumped ahead of you there and

(Testimony of Paul Harvey Hammond.)

identified those earlier. The column you refer to came from Exhibit 35.

Q. Now, the last one, "Holly Back Log End of Year Units"?

A. Is from Exhibit 37.

Q. I notice that you have a notation with a double asterisk, being 2,705 new type balance O type opposite the 23935. Will you explain that in greater detail?

A. That is done to identify our sales of the new type heater with the secondary heater exchanger. That is referred to as new and indicates that in the year 1950 when this was first introduced on the market there were only a very small percentage of our sales on the new model heater.

Q. Is that the heater that we have identified here as Plaintiff's Exhibits 20-A, -B and -C?

A. Yes, sir, it is. [540]

Q. Now, I notice there are three asterisks under the next figure, 39,319, and I ask you if your same comment applies.

A. Yes, sir, except in this instance you will note the new type wall heater accounted for virtually all of our shipments.

Q. Now, in the years 1952, 1953 and 1954, under "Holly Wall Heater Shipment Units," I note that you have no asterisks. Do those figures represent new—the shipments of the new type of heater? And by that I mean that exemplified by Exhibits 20-A, -B and -C.

A. Yes, sir, they do.

(Testimony of Paul Harvey Hammond.)

Q. Were any old heaters manufactured and sold in that interval?

A. There were none manufactured, and any that were sold would have been negligible. There might have been one or two units that might have come back in return and exchanged, but that would have been the extent of it.

Mr. Lyon: Your Honor, we are going to have a long, hard cross examination of this witness for one reason. He has grouped all these heaters together. The very reason I objected to this original report as not being a complete report. They make two heaters now, and there has been no segregation of those heaters in this report.

Mr. Christie: I think I can clarify that, your Honor. [541]

Mr. Lyon: Then I think he had better make that distinction now. And, I don't mean that they are old type and new that he has testified to. I mean they are making two wall heaters at present; the one here and a two-room type unit which doesn't use, in any sense, the dimensions of the patent in suit. And he says here that these are all sales of heaters of Holly. So those must be included.

Q. (By Mr. Christie): You testified that these were all heaters of the type identified as 20-A—this being the so-called box, this being the shell and this being the economizer. Do you want to amplify that answer in any respect?

A. If I understand the question correctly, it should be amplified to this extent: That I have

(Testimony of Paul Harvey Hammond.)

been speaking of the new type wall heater as one utilizing the secondary heat exchanger. This, of course, is one model of the unit which uses the secondary heat exchanger. The ones which I have identified as new all do utilize that secondary heat exchanger, although there are more models than the specific one shown here.

Q. Are you familiar with this heater, the construction of the various models?

A. Reasonably so, yes, sir.

Q. Can you tell us whether or not the air for the secondary heat exchanger in each instance comes up outside the lower box and inside the wall? [542]

A. That would be true of the heaters identified as new on this report.

* * * * * [543]

Mr. Christie: Your Honor, during the noon recess, as you suggested, we have produced the heater with the outlet on both sides of the wall, this is the lower box, which I will ask the clerk to mark for identification as Plaintiff's Exhibit next in order, 44, I believe.

The Clerk: 44.

(The document referred to was marked Plaintiff's Exhibit 44, for identification.)

* * * * * [544]

JOHN H. HOLLINGSWORTH

recalled as a witness by and on behalf of the plaintiff, having been heretofore duly sworn, was examined and testified further as follows:

Direct Examination

Mr. Christie: Do you want him resworn, your Honor?

The Court: No. He has already been sworn. Have you not?

The Witness: Yes, sir.

Q. (By Mr. Christie): Mr. Hollingsworth, I call your attention to what appears to be a lower box which has been marked for identification as Plaintiff's Exhibit 44, and I ask you to tell me what it is.

A. Well, that is a dual model wall heater which distributes heat into two rooms.

Q. What secondary heat exchanger does it employ?

A. It uses the same heat exchanger as is used on the model as shown by Exhibit 20.

Q. 20-A, I believe. A. 20-A.

Q. Mr. Hollingsworth, I place Exhibit 20-A on top of Exhibit 44 for identification. Is that the way the two things go together? A. Yes. [547]

The Court: So from the exchanger the air is emitted into only one of the two rooms?

The Witness: Yes, that is correct, your Honor.

Mr. Christie: May I offer Plaintiff's Exhibit 44 in evidence, your Honor.

Mr. Lyon: No objection.

(Testimony of John H. Hollingsworth.)

The Court: It may be received in evidence.

(The exhibit referred to was received in evidence and marked as Plaintiff's Exhibit No. 44.)

Q. (By Mr. Christie): Mr. Hollingsworth, I note that Exhibit 44 consists of two parts, a white painted front portion and a rear box. Would you identify the two portions? First, the white portion that I have just removed.

A. That is the front trim or panel.

Q. What does that correspond to?

A. That corresponds with Exhibit 20-B. The other portion, which is the box containing the first radiators, is similar to, or performs the same functions as the box illustrated by Exhibit 20.

The Court: And it employs the same grille, same type of grille?

The Witness: It is basically the same panel. The only variation is in the height of the panel.

The Court: I am referring to the grilles over the outlet. [548]

The Witness: The grilles are identical, your Honor.

The Court: That is, the grilles that go with Exhibit 44 are identical with those that go with Exhibit 20, and so forth?

The Witness: With the exception of some variation in the height of that grille.

Q. (By Mr. Christie): Mr. Hollingsworth, will you tell me whether Exhibit 44 has a lower or first radiator inside the box?

(Testimony of John H. Hollingsworth.)

A. Yes, it does. It has two of them.

Q. And does it have a draft hood?

A. Yes, it does.

Mr. Lyon: If your Honor please, we will stipulate that it has all of the physical properties of Exhibit 20, except the operation of the device. That is the thing that is in question here.

Mr. Christie: Your Honor, I introduced it at Mr. Lyon's request. I was simply trying to clarify the record for him.

Mr. Lyon: I am just trying to save some time.

Mr. Christie: I will simplify the matter by withdrawing the last question and ask Mr. Hollingsworth to describe the operation of Exhibit 44.

The Court: Does it operate in the same way as Exhibit 20?

The Witness: Fundamentally the operation is the same in [549] this respect: that the same air that is supplied to the secondary heat exchanger is drawn from the floor level beneath the panel, moves up outside the box and inside the wall, into the secondary heat exchanger, and is the only source of air flow for the secondary heat exchanger.

Q. (By Mr. Christie): Does it move up the sides of the box?

A. It obviously differs in one respect; that being a dual model, the air moves up only the sides of the box, rather than the back of the box.

Mr. Christie: That is all, your Honor.

Mr. Lyon: May I cross examine just as to this item?

(Testimony of John H. Hollingsworth.)

Cross Examination

Q. (By Mr. Lyon): Mr. Hollingsworth, is this heater put together in a position, as far as the outer panel and the inner box is concerned, in the manner it would be when it was installed in a house?

The Court: Referring to Exhibit 44?

Mr. Lyon: Exhibit 44.

The Witness: Essentially in the proper manner, yes.

Q. (By Mr. Lyon): All right. Mr. Hollingsworth, on the heater marked Exhibit 20, is there any inlet, any place on the front of the economizer—I mean on the second heat exchanger? [550]

A. No, there is not. [551]

Q. Mr. Hollingsworth, I will call your attention again to Exhibit 44; how about this opening through here, which I am sticking my pencil through, isn't that an opening from the front into the secondary heat exchanger?

A. No, it is not.

Q. It is not? A. No, it is not.

Q. Why isn't it? I can stick a pencil through it and run it around.

A. Because that passage doesn't communicate with the secondary heat exchanger.

Q. Well, then, we will take a look at this passage here through which I can stick my pencil.

A. In production there can be a minor gap there because of production tolerances. That heater has been somewhat damaged on the way down, and I

(Testimony of John H. Hollingsworth.)

think that the gap there is substantially greater than might normally be expected in production. Certainly any gap that exists there is not there for any functional purpose.

Q. Now, this heater uses 45,000 B.T.U.'s, does it not? A. Yes, that is correct.

Q. And you have shut off all circulation up the back, haven't you?

A. There is no back, there is no circulation up the back. [552]

Q. That's right. So that it all must come between the studs and here (indicating)?

A. That is correct.

The Court: "Here" being the outer side wall of the lower box?

Mr. Lyon: The outer side and the studs.

Q. (By Mr. Lyon): You are putting almost a third more heat into this one?

A. Do you mean into the furnace itself?

Q. Yes. A. Yes, that is correct

Q. A third more heat into this one—strike that. Pardon me. What is the B.T.U. rating of Exhibit 20? A. 35,000.

I think a third would be a little out of line.

Q. Well, it is between a quarter and a third, then. A. All right.

Q. I wasn't sure whether it was thirty-five or twenty-five.

A. There is more input on Exhibit 44 than there is on Exhibit 20, yes.

Q. Then, frankly, this draft up the back has very

(Testimony of John H. Hollingsworth.)

little effect, you can put more heat in this one, and the same economizer, and less air goes into the secondary heat exchanger on this one, doesn't it (indicating Exhibit 44). [553]

A. No, I think a little more goes into it.

Q. It goes into this opening here, does it not?

A. Most certainly not. Up the back side.

Q. Do you put these in a wider wall?

A. No.

Q. In the same wall? A. Certainly.

Q. Then, they have the same size at the sides, don't they, as the other one?

A. There is more area on the sides of that box than there is on the other.

The Court: That box being Exhibit 44?

The Witness: Exhibit 44.

Q. (By Mr. Lyon): But it is still only a four-inch wall, the rest of this sticks out in the room, doesn't it?

A. Mr. Lyon, that conduit that comes up the side of the box consists of four sides, one of which is the outside of the lower box, the other is the stud space in the plaster that forms the wall thickness, and the other two sides are the panel side rails.

Q. Is there anything that comes up here between the wall and the heater, that comes up in the space through this outer shield? A. Yes.

Q. That is between the walls of this box and the wall? [554] A. Yes.

Q. Isn't it a fact that this is outside the wall, this whole shield is outside the wall?

(Testimony of John H. Hollingsworth.)

A. That is outside the wall, but it is a member that contains that passageway in the wall, yes.

Mr. Lyon: May I have your ruler a minute, please?

Q. (By Mr. Lyon): We have a four-inch wall here. Whereabouts in the four-inch wall would the Exhibit 20 heater go? With this ruler will you mark off where the studs would be?

A. The center line of the stud space would coincide with the center line of the major axis of the oval outlet collar at the top of Exhibit 20. I will draw a pen mark on the top of the box about in the location where that would be.

The stud, then, would be centrally located on that line, so that the stud would lay in here substantially like this (indicating), providing approximately a $\frac{3}{8}$ -inch gap back here, and projecting forward about to the point that I have marked at the edge of the top of the box. So that the portion that projects out of the wall on Exhibit 20 is identical to the portion that projects out of the wall on each side of Exhibit 44. The two are identical in that respect.

Q. Then you have no more space between the side walls of the box on that one than you do this one?

A. Yes, I do. [555]

Q. Between this wall and the box, any more area?

A. Between that wall and the box?

Q. I mean the wall and this box.

A. There is more area, the distance between the box and the wall is substantially the same, but the

(Testimony of John H. Hollingsworth.)

area of the conduit provided by that and the panel side rails is greater.

Q. Now you are adding the panel side rails. I said between the wall of this box and the wall.

A. There is no area there. That would be a distance.

Q. I mean the space here.

A. Defined by that area, that would be less—that would be the same, excuse me, on either installation.

Q. Now, you say these openings in the front panel of this Exhibit 44 are merely because of manufacturing tolerances and so forth?

A. Yes, there is about between a thirty-second and a sixteenth of an inch gap that is provided there for manufacturing tolerance purposes. Otherwise the panel would not install properly in the field.

Mr. Lyon: That is all, your Honor.

Mr. Christie: Mr. Hollingsworth, may I borrow your tape for just a moment?

Mr. Lyon: Pardon me. May I ask the witness one more question?

The Court: You may. [556]

Q. (By Mr. Lyon): Would you show me exactly where the studs come against this one? Put your hand in the position, the shape up and down.

The Court: Exhibit 44?

Mr. Lyon: In Exhibit 44.

The Witness: Again, the center of the stud coincides with the major axis of the oval outlet on the

(Testimony of John H. Hollingsworth.)

top of the first box, so that the stud splits that axis and lies substantially in this position here (indicating).

The Court: Could you mark it, Mr. Hollingsworth, in the same manner in which you marked it a few moments ago on Exhibit 20 on the top?

The Witness: Yes, your Honor. I will mark the center line of the box and the stud on the top of Exhibit 44, and I will mark the outer extremities of the wall on the top of the box of Exhibit 44.

Q. (By Mr. Lyon): Now, does the wall contact—does that stud contact this frame member?

A. The plaster on the stud contacts it, yes.

Q. Now, will you please, then, show me where there is any conduit up the side of this thing into the center, then? You have got a stud against here straight?

A. No, I haven't.

Q. You have got the plaster, then, haven't you?

A. There is a space, as I said—there is approximately [557] a half inch, five-eighths of an inch gap between the box side and the stud. That defines two sides of the conduit. The panel side rail on each side of the wall defines the remainder of the conduit. [558]

Mr. Lyon: I will get my book. The witness has stated—I am not trying not to move the local position of these two—that the stud sits right there (indicating). In other words, one wall of that stud, or the wall itself, is in that position there tight against this frame.

(Testimony of John H. Hollingsworth.)

Q. (By Mr. Lyon): Isn't that true?

A. That is correct.

Q. Doesn't that block every bit of air coming up there from getting into that stud space?

A. No, I don't believe you understand, Mr. Lyon. There is still $\frac{5}{8}$ of an inch gap here all the way down.

Q. Oh, this is out this way $\frac{5}{8}$ of an inch.

A. That is correct.

Q. What is the size of this gap on the front?

A. The size of the gap where?

Q. On the front of the heater?

A. Size of the gap—I don't understand.

Q. The one I was putting the pencil through.

A. The gap on the front of the heater? You mean this one (indicating)?

Q. Either that one or the one below it; either one of these two that go through.

A. Well, I would have to have a rule to measure that, but the gap below here——

Mr. Christie: Here is a ruler, Mr. Hollingsworth. [559]

The Witness: The gap below is a little over $\frac{3}{8}$ of an inch. The gap above, as this one happens to be sitting here right now, is $\frac{5}{32}$.

Q. (By Mr. Lyon): Isn't there—both of these gaps you have just referred to—there is one of them on each side in each room?

A. The two panels are identical on both sides.

Q. And would have the same opening on both sides?

(Testimony of John H. Hollingsworth.)

A. On the lower gap, yes. The top is not a representative gap.

Q. Then this isn't a representative heater?

A. Mr. Lyon, that heater was brought down on the truck in a hurry, and I think the top obviously has been bent. And I testified that——

Q. Oh, it is bent in this corner? Is that normally at right angles to the rest of the heater?

A. Yes, sir.

Q. Will you show us where it is bent then? We will remove the cover on Exhibit 44 and you show us where this is bent.

A. This angle is obviously not at right angle—the box has obviously been collapsed right here. If I were to straighten that up in right angle position, the position it was supposed to be, I think you would find this gap would be about a 32nd. [560]

Q. About a 32nd on each side? A. Yes.

The Court: The top gap, there between the flange on the front, top of the lower box of Exhibit 44 and the shell or trim?

The Witness: Correct.

Q. (By Mr. Lyon): Now, have you straightened it? A. No.

Q. Will you straighten it up then and then we will put it together. I want to see.

A. I don't know if I can straighten it by hand or not. The metal is probably stretched.

That's about as straight as I can get it.

Q. Now, will you assemble it? I am not going to measure that bent corner. I recognize, as the

(Testimony of John H. Hollingsworth.)

court does, that that gap made by the bent corner isn't of any importance. A. Witness complies.)

Mr. Lyon: Well, I will now call the court's attention to the gap. The opening is still there.

Q. (By Mr. Lyon): This is in the condition now it should be?

A. No, sir, not exactly. Approximately in that condition, yes.

Mr. Lyon: That is all, your Honor.

Mr. Christie: One question. [561]

Redirect Examination

Q. (By Mr. Christie): Mr. Hollingsworth, how much space is there between the studs on each side of Exhibit 44 when it is installed in the wall, and the side of the outer lower box?

A. Approximately $\frac{5}{8}$ of an inch is the space between those two.

Q. That is the conduit up inside the wall, the width of the conduit up inside of the wall?

A. That would be what I would define is the minor dimension of that conduit.

Mr. Christie: That is all, your Honor.

The Court: The space through which this air travels from the base of the lower box into the heater exchange is a space the width of the lower box and the depth of $\frac{5}{8}$ of an inch, is that right, on either side?

The Witness: The space through which the air travels up through on each side of the box is defined by the conduit that is $\frac{5}{8}$ of an inch wide in

(Testimony of John H. Hollingsworth.)

one dimension and the other dimension would be the width of the wall, plus the depth of the panel and side rails. I could not strictly define that dimension because the panel side rail has a slight slope to it.

The Court: In other words, the width of the box proper, that is, the aluminum colored portion of the lower box, plus the width of the trim, or panel?

The Witness: The closest dimension would be the width of the lower box, the aluminum portion of the lower box, times $\frac{5}{8}$ of an inch.

The Court: You don't add to that the width of the trim or the panel?

The Witness: That would be some contribution, but a cross-section of that area there would show an irregular shape at each end, and I would not consider that as being a really effective area.

The Court: I have nothing further.

Mr. Lyon: I have one question, your Honor.

Recross Examination

Q. (By Mr. Lyon): What are the tolerances to which carpenters are putting these studs together—what are the tolerances they maintain?

A. They are not too accurate. The studs are supposed to be on 16 inch centers. They can vary quite substantially. However, usually the heating installer, if the stud location is too inaccurate, will have to relocate it himself because he must attach the header plate at the base of the secondary heat exchanger, or the header plate used on any appliance for that matter, to the stud. And if the stud width is too far

(Testimony of John H. Hollingsworth.)

off one way or the other, he either can't get it in or [563] can't make proper connection. So I don't know what would be a normal tolerance.

Q. Often the space between the wall and sides of this box can be as little as an eighth of an inch?

A. No, never be that small, because you couldn't get the economizer in if it were, without disfiguring it.

Mr. Lyon: I think that is all.

Mr. Christie: One more question raised by the last.

Redirect Examination

Q. (By Mr. Christie): Mr. Hollingsworth, you spoke of the header plate as defining the minimum dimension between the studs. By the "header plate"—now referring to Exhibit 20-A—did you mean this plate here at the bottom with the two flanges?

A. Yes.

The Court: Bottom of Exhibit 20-A?

Mr. Christie: Yes.

Q. Would you measure the distance from outside of flange to outside of flange?

A. That's 14-3/16 inches.

Q. And that 14-3/16 inches would then be the minimum spacing?

A. Yes. We make that 14-3/16 because, theoretically, the distance between the studs should be 14 1/4. We allow a [564] 16th inch gap.

The Court: What is the overall dimension of Exhibit 44, the lower box?

The Witness: I believe that that is 13 inches, your Honor. Yes, 13 inches. * * * * * [565]

(Testimony of John H. Hollingsworth.)

Q. (By Mr. Christie): Mr. Hollingsworth, you have spoken about the lower furnace, which is represented by Plaintiff's Exhibit 20-A, and Exhibit 44. Does Holly have any other forms of wall heaters other than those two?

A. There are basically four models in the series, two of which are what we'd term dual models, which would be exemplified by Exhibit 44; and two which are what we term single models, which are exemplified by Exhibit 20. Those models which are exemplified by Exhibit 20 also have a smaller rear outlet grille on some versions on the upper portion of the back of the lower box, which will communicate with the room behind the lower box.

Q. What would you say with respect to the two dual models? What is the difference between them?

A. The two dual models are essentially identical, with one exception, and that is the height of the unit. There is one dual model which is more nearly the height of Exhibit 20. You will notice that Exhibit 24 is somewhat shorter than Exhibit 20.

Q. Exhibit 44?

A. Exhibit 44. That different height allows for some extra height in the first radiator to compensate for the difference [566] in input radiator.

Q. Do you have some identifying numbers?

A. Yes, we use identifying numbers. Those numbers can be changed from time to time for our own purposes of identification where we might make a tooling revision to simplify production or for some reason such as that. [567]

(Testimony of John H. Hollingsworth.)

The Court: And you make four models of wall heaters, is that correct?

The Witness: Basically.

The Court: All of them use the secondary heat exchanger?

The Witness: That is correct.

The Court: And all of them operate as you have described, the primary difference, I take it, is the difference in B.T.U. capacity, is that right?

The Witness: That is correct. * * * * *

Recross Examination

Q. (By Mr. Lyon): Do these other two models we don't see here have the openings on the front as shown in Exhibit 44?

A. The openings on the front, are you referring——

Q. The ones we have been discussing.

A. Referring to the last opening that I measured for you?

Q. Yes, these openings here (indicating).

A. Again I would repeat that normally there is a thirty-second to a sixteenth of an inch gap provided there. [568]

Q. In these other two? A. In all models.

Q. Is there one in 20?

A. Probably it could be that that is substantially less than that. That is the reason that we provide that normal gap for production tolerances. * * * * *

PAUL HARVEY HAMMOND

called as a witness by and on behalf of the plaintiff, in rebuttal, having been previously sworn, resumed the stand and testified further as follows:

Direct Examination—(Resumed)

Q. (By Mr. Christie): Mr. Hammond, over the noon hour I asked you if you could tell on the basis of figures that are already in evidence here what portion of the heaters sold by Holly in the years 1950, '51, '52, '53, and '54 have been of the single variety exemplified by Exhibit 20 and 20-A, and what proportion are the dual model exemplified by Exhibit 44; have you been able to determine that by the other figures?

Mr. Lyon: And the other two models, please.

Q. (By Mr. Christie): Referring to all models. Please distinguish between what I call the single models which are like 20, of which there are two, and the dual models of which there are also two, exemplified by 44.

A. Yes, that computation is readily available from the figures which were submitted as Exhibit 36, by referring to the various model numbers which are listed there, and then subtotaled as new style models, I added the 45 ND and 55 ND, which are the two types exemplified by Exhibit 44, and that amounts to 21 per cent of the total shipments of new style wall heaters, which were shown in Exhibit 36.

The Court: For what period?

The Witness: That would be for the five-year period covered—

(Testimony of Paul Harvey Hammond.)

Q. (By Mr. Christie): Do you have the figure year by year?

A. Yes. That can be—I haven't subtotaled it for these two models year by year. I merely ran one total.

Q. Could you do it now without too much difficulty and without taking too much time?

A. Do you want percentage figures on this?

Q. If you would, please.

A. Roughly it would be about 18 per cent in 1951, about 20 per cent in '52, about the same for '53, and 21 or 22 per cent for '54. Very little variation from year to year, [569] apparently.

Q. (By Mr. Christie): Mr. Hammond, referring now to Plaintiff's Exhibit 43, I notice that Holly wall heater shipments were 11.3 per cent of the national market in 1950, the first year in which the new models were made and sold; 19.1 in 1951; 18.8 in 1952; 14.6 in 1953; and 17.5 per cent in 1954. Will you explain, if you know, why the figure of 14.6 per cent representing the 1953 percentage is below that of other years?

A. Well, I think there were several reasons why our percentage of the national market dipped in 1953.

We, of course, had an allocation program which was in effect starting with the second quarter of 1951 and extending through the first half of 1953. That strictly limited the available material.

Q. Who imposed that allocation?

A. That was imposed by the War Production Board, Federal Government Regulations, as a re-

(Testimony of Paul Harvey Hammond.)

sult of the Korean War. And, consequently, each manufacturer of heating equipment, together with other manufacturers using critical products, had to make application to the Government for, in our case, steel, which was used, and the volume of steel which we had available to produce heaters was limited through the Government.

Our back-log situation became so critical at the end of 1952, which is exemplified on Exhibit 43, that we had to put a sales allocation program into effect and restrict sales because of inability to deliver.

Q. Who recommended, if you know, that that sales allocation program be made?

A. That was my recommendation to the company, sir. * * * * * [571]

Q. (By Mr. Christie): Will you please testify, then, as to what happened on this allocation program?

A. If I may refer to Exhibit 43, you will note that at the end of 1952 our order back-log had increased to some 18,000 units as against some 7,000 units that we had on order at the start of that year.

In the face of that tremendous increase in order back-log, coupled with the fact that we had been rather dangerously falling down on delivery commitments made to people in the trade, I recommended that we institute a sales allocation program in effect limiting the number of heaters the different classes of customers could buy, so that we could balance our available supply with the demand and the orders that were currently being asked to fill.

(Testimony of Paul Harvey Hammond.)

That recommendation was followed. We set up rather elaborate mechanics for handling it through our sales office, and it remained in effect during the first half of that year, and of course drastically affected our sales effort through the year, because we were doing the very reverse of selling for at least half of the period.

Q. Are there any other factors that influenced the reduction in sales during 1953, if you know?

A. I would say that concurrently with that we were reaching the limit of our plant capacity, which was another factor, certainly, that entered into my original recommendation. It was impractical to consider construction of a new plant at a time when government allocations were in effect, [573] and we could not be sure of our ability to get material to utilize excess capacity. So we did a considerable amount of subcontracting in an effort to increase our sales, but it was inadequate, and during the latter part of 1953 we added approximately 50 per cent to our plant capacity, some 27,000 square feet was added in the latter months of 1953, but of course did not materially increase our capacity during that year.

Q. Were there any other factors, Mr. Hammond, that you know of?

A. I think we should mention the fact that Coleman came into the field during this period with a competing device. That, I believe, was initially introduced in the latter months of 1952, and of course became most effective during this year 1953. And I

(Testimony of Paul Harvey Hammond.)

think that it also is worthy to mention that a number of other manufacturers of wall heaters have come into the business during this period that we have been talking about.

Q. Heaters with secondary heat exchangers?

A. No, sir; with the exception of Coleman.

Q. Coleman was the only one?

A. That's right. * * * * * [574]

Q. (By Mr. Christie): Mr. Hammond, do you know whether or not there was an increase in price of the heaters with the secondary heat exchangers as compared with the older models, at the time that you changed from one to the other?

A. Yes, sir, there was such an increase in price.

Q. Do you know how much that price was?

The Court: Percentagewise?

Mr. Christie: Percentagewise or otherwise.

The Witness: That varied from model to model. Percentagewise I would say it was just a little under 10 per cent.

Q. (By Mr. Christie): That you actually increased your prices, that is by 10 per cent?

A. The amount of increase in the prices shown.

I think I might qualify that by saying that effectively that perhaps was a somewhat lesser increase, because obviously the secondary heat exchanger, which is referred to here as Exhibit 20-A, would replace a certain amount of vent material which would be used with the conventional style of heater.

Q. How much of the increase in price would that absorb, if you know?

(Testimony of Paul Harvey Hammond.)

A. There is a considerable variation in the types of vent material used, and the price, but assuming a top quality [576] double wall strength, which would be the most expensive installation, I would say probably around \$2.50.

Q. As compared to what? Your other figure is a percentage figure.

A. That would perhaps account for half of the increase. So I would say our effective increase was perhaps closer to five per cent.

Q. You can remember this without reference to any documents?

A. I can remember this on the average. I would have to look at documents for any specific price increase on a given model.

The Court: When did this price increase occur? When did it take effect?

The Witness: It took effect as the new models were introduced into the field, your Honor.

The Court: What year?

The Witness: That was during 1950.

The Court: The price has been the same since, has it?

The Witness: No, there have been other adjustments in price since, but essentially we have always maintained this and had to, at a slightly higher level than we had the competing device. This particular one, I think, can clearly be attributable to the introduction of this new style heater, because at the time it was made our old style wall heater [577]

(Testimony of Paul Harvey Hammond.)

prices remained the same, until they were gradually worked out of our inventories. It was not part of a general increase. [578]

Mr. Christie: Your Honor, we were about to put in evidence a great many documents relating to the approval of the Holly wall heaters, with the secondary heat exchanger, by the American Gas Association. To save time, Mr. Lyon has kindly consented that if I would state that we had AGA approval on all of those models, starting in 1950, and as the subsequent models come in we had AGA approval on all of them, and we still have that AGA approval on all models, he has kindly consented to stipulate that is the fact.

Mr. Lyon: I will accept the statement of counsel and so stipulate.

The Court: I assume, as a practical matter, it would be very difficult to market one without the American Gas Association approval.

Mr. Lyon: I am afraid in most places it would be against the law. Most city codes provide if you haven't got it, you can't sell it.

Mr. Christie: I will now call Mr. Hollingsworth.

JOHN H. HOLLINGSWORTH

recalled as a witness on behalf of the plaintiff, having been heretofore duly sworn, was examined and testified further as follows:

Direct Examination

Q. (By Mr. Christie): Mr. Hollingsworth, were

(Testimony of John H. Hollingsworth.)

you in [579] Wichita to witness the tests which were conducted by Mr. Petoff and Mr. Blazier, and which are reported in Mr. Blazier's deposition and in Defendant's Exhibit R, which I will show to you? A. Yes, I was.

Q. Do you believe that these tests were properly conducted? And if not, state your reasons.

A. No, I don't believe they were. I have had considerable experience running smoke tests over a long period of time, and in my opinion it was fairly obvious, quite obvious that the basic assumption that the only air moving up behind the box, the first box and into the second box was within the confines of the patterns that are shown in this book; that that basic——

The Court: This book being——

The Witness: This book being Exhibit R.

Q. (By Mr. Christie): Would you identify the page, too, so that we are sure we know that you are talking about?

A. I am referring to the pattern shown by the drawings numbered 43-17-1, and by the drawing immediately following that, which has no number but which is entitled "Flow Behind Heater."

The Court: Those are the next to the last and last pages in the book, respectively, are they not? The book being Exhibit R? [580]

The Witness: They are, your Honor.

Q. (By Mr. Christie): Did you conduct any smoke tests yourself on the heaters at the time of the Wichita tests? A. Yes, I did.

(Testimony of John H. Hollingsworth.)

Q. Will you describe the tests and tell what the results were?

A. Yes. It was my observation that the pattern defined as shown on the last two pages of Exhibit R was in error, if it were assumed to be the only air movement up behind the first box. I demonstrated that by placing the smoke wand in a position other than had been established by Mr. Blazier or Mr. Petoff, and was able to demonstrate that air moved outside of the pattern upon which they had based their assumptions. This was visually shown by smoke moving upward behind the box outside of the pattern shown on the last page of Exhibit R.

Q. Will you identify the position and mark it, if you will, with the letter Q, where you noted additional smoke moving up?

Mr. Lyon: If your Honor please, I would like not to have these exhibits marked up here. These were made at one——

The Court: Can he just describe it without marking it?

Mr. Christie: Certainly, your Honor.

Q. (By Mr. Christie): Would you describe it, Mr. Hollingsworth? [581]

A. Yes. I placed the wand at such a position that I got a new smoke pattern which was up the side of the box, outside completely of the confines of the area described by the drawing on the last page of Exhibit R.

Q. Now, what would be the effect on Mr. Blazier's calculations of the 4 per cent contribution from

(Testimony of John H. Hollingsworth.)

the back and sides of the lower box to the output of the upper grille of the secondary heat exchanger or economizer, if you know?

A. In my opinion, the 4 per cent figure would have no significance whatsoever because the basic assumption upon which that 4 per cent figure was predicated was completely in error.

Q. Which direction, if you corrected that error, would the percentage figure be, higher or lower?

A. Very substantially higher.

Q. Now, did you notice anything else that was irregular about the tests?

A. Yes. I noticed that the panel or trim, which is Exhibit 24-A, was so installed that there was quite a gap between the panel and the wall so that air could move in to that gap, and that that gap broke the conduit that was supplied up the sides of the box and introduced a fresh source of air supply, outside of the source of supply at the base of the heater where the smoke was normally placed. This would undoubtedly vitiate the results of the tests as they were conducted. [582]

Q. What did you do about those gaps, if anything?

A. I taped the gaps up, to seal them, with scotch tape; and found that the flow up the back, as observed by a new smoke pattern, was established—was substantially different.

Q. What did it do to the smoke pattern?

A. In my opinion, it increased the flow substantially.

(Testimony of John H. Hollingsworth.)

Q. Was the smoke pattern wider than it had been or narrower, or what?

A. The smoke pattern was substantially different than it had been in that it spread over a greater area.

Q. Did it include the entire box?

Mr. Lyon: Your Honor, the witness has now testified to several smoke patterns. I think he is inferring now these are the smoke patterns that Mr. Blazier did. I think he means the smoke patterns he was able to perform——

The Court: Mr. Blazier or Mr. Petoﬀ?

Mr. Lyon: Mr. Blazier and Mr. Petoﬀ made one set of tests and he made another one. And I want to know, just to correct the testimony now, whether these smoke patterns he is now testifying to are the ones he made with the wand or the ones these gentlemen made.

The Witness: The smoke patterns I am now testifying to are the smoke patterns that I made.

The Court: Be certain to specify that so the record will be clear. [583]

Q. (By Mr. Christie): With the gaps in the side of the box taped up? By that I mean in the trim? A. Yes.

Q. Would you identify where the gaps were, with reference to Plaintiff's Exhibit 24-A?

A. Yes. The gaps were in the area where the—on the sides of the panel where the return flanges on the outside of the panel would normally engage the wall.

(Testimony of John H. Hollingsworth.)

The Court: In this test they would abut the glass, would they?

The Witness: No. In these tests the forward portion of the wall was plaster.

The Court: So they were abutting——

The Witness: To a plaster wall.

Q. (By Mr. Christie): Now, did you observe any other irregularities in those tests, Mr. Hollingsworth?

A. Yes, there were several others; only one which I think is of real significance. That is that the heaters installed in the plaster wall had been installed before the wall was plastered, and that expanded metal lath was used as a base for plastering, which in my personal experience is something I have never seen in residential construction. This provided a condition where the plaster essentially completely blocked the space behind the heater.

Q. What effect would that have upon the contribution of [584] air from the back of the lower box to the economizer?

A. It would seriously reduce the amount of air that moved up the back, because the extent to which the plaster was driven through the expanded metal lath was abnormal.

Q. Will you refer to Plaintiff's Exhibit R and see if you find in the book anything which shows that the heaters were installed in the wall before the wall was plastered?

Mr. Lyon: If your Honor please, in this matter, again, we are getting into another one of these sets

(Testimony of John H. Hollingsworth.)

of half truths. The witness here—we will admit we built one of these and the back was plugged, and it was so stated. The other one had a glass back on it. Now, he says the test was in error because we had a plugged back. Well, he is forgetting that the tests, all except the test on the plugged back, were made on a glass back just the same as he showed in the tests they made.

Now, why do we have—I will stipulate that we made tests with the back plugged——

The Court: Also, with the glass?

Mr. Lyon: ——and that these other tests that we are relying on here in these smoke patterns were made with the glass back. And the witness can't deny that.

Mr. Christie: We are content with that stipulation, your Honor.

Q. (By Mr. Christie): Mr. Hollingsworth, during your cross examination the other day, Mr. Lyon asked you if you had [585] compared the cross-sectional areas for flow into the 3-foot economizer and the 4-foot economizer from the room and from the back and sides of the lower box—by “from the room” I mean through the grilles 7 and 8—and you testified that you had not compared those areas. Have you compared the areas now?

Mr. Lyon: That is objected to as not rebuttal testimony. He has finished his redirect examination and this is on his main case.

The Court: Do you wish to reopen your case in chief for that purpose?

(Testimony of John H. Hollingsworth.)

Mr. Christie: No, your Honor, except at that point we forebore calculating simply to save time. We have now made the calculations and I do not think it disturbs the order of proof particularly to put it in at this time. It is very short and won't take more than a minute.

The Court: Very well. You may reopen your case in chief for that purpose.

Mr. Christie: To that extent.

Would you read the question to the witness?

(Question read.) [586]

The Witness: Yes, I have.

Q. (By Mr. Christie): Will you give that comparison?

A. The entrance area provided by the louvre openings at points 7 and 8, on the Coleman panel——

Q. Plaintiff's Exhibit——

A. Plaintiff's Exhibit——

Mr. Lyon: 24-A.

A. (Continuing) Plaintiff's Exhibit 24-A, I calculated by measuring the width of the slot, the length of the slot, times the number of the louvres, and I find that the area is approximately 9 square inches.

Mr. Lyon: 19? I couldn't hear you.

The Witness: 9.

I then calculated the area on the three-foot economizer, or the area provided up behind the box, as a flow area into the three-foot economizer, and by taking the 13-inch dimension which has been

(Testimony of John H. Hollingsworth.)

established, and the vertical gap of a quarter of an inch, which has been established on the three-foot economizer, I find that that area is 3.25 square inches.

The Court: This last figure is the area of air space between the back of the lower box on the Coleman heater, the Coleman heater exemplified by —What is that exhibit number there?

The Witness: Exhibit 25.

Mr. Christie: 25 and 25-A, your Honor. [587]

The Court: (Continuing) —between the back of that and the wall?

The Witness: No, your Honor. That is the area of the gap, the entrance area provided by the gap between the base of the economizer and the top of the box.

The Court: The base of the economizer—

Mr. Christie: Perhaps if I mount the economizer on top of the heater, Mr. Hollingsworth can demonstrate to your Honor.

The Witness: I took the width of the lower box, times the quarter-inch gap that is provided by the construction of the economizer between the lower box and the base of the economizer. That I considered to be a reasonable index of the entrance area provided to the economizer. That does not include the area on the side between the sides of the box and the wall.

Q. (By Mr. Christie): What was that area so computed?

A. Three and a quarter square inches.

(Testimony of John H. Hollingsworth.)

Q. What is the proportion of the total area that is represented by the gap from the back and sides of the lower box?

The Witness: That area, I don't have the figures with me, but my memory I recall that it was 59 per cent.

The Court: Of what?

Mr. Christie: Of the three-foot economizer?

The Witness: No. On the order of 25 per cent.

The Court: Of what?

The Witness: The area provided from the lower box into the economizer is 25 per cent, approximately, of the area provided through the points 7 and 8 to the economizer.

The Court: I thought it was around three square inches as to nine square inches.

Mr. Lyon: I point out to the witness he has a great big obstruction over three-quarters of that area.

The Witness: I attempted to compensate for that by not including the area up the sides of the box, between the box and the studs.

I don't believe I am explaining the percentage figure correctly.

The percentage of the total area available, entrance area available to the economizer, which is comprised of that area up the back and sides of the box, and the area through the louvres points 7 and 8, the percentage of that total area which is available up the back is approximately 25 or 26 per cent.

(Testimony of John H. Hollingsworth.)

The Court: In other words, you take your nine square inches and add the three and a fraction square inches, and then the three and a fraction square inches is 25 per cent of the 12 total, is that what you mean?

The Witness: Correct. [589]

Q. (By Mr. Christie): Did you do the same thing with respect to the four-foot economizer?

A. Yes, I did.

Q. What was the result there?

A. I found, again establishing the percentage in the same manner, that the percentage of the total area available, that was provided up the back, was approximately 59 per cent.

Q. How did you arrive at that figure?

A. In the same manner as I arrived at the other figures, with one exception; that on the four-foot economizer, rather than being a one-quarter-inch gap here, under installed conditions it is a one-inch gap, according to the Coleman installation instructions.

Mr. Christie: That concludes the examination on this point, your Honor. Do you want to interrupt now for cross examination on this part?

The Court: Why don't you conclude, first.

Q. (By Mr. Christie): Mr. Hollingsworth, you testified that you and Mr. Bedell were the inventors of the patent in suit. Will you describe to me, if you will, what the problems were in the wall heater industry as you knew them at the time you made the invention, and how you solved these problems?

(Testimony of John H. Hollingsworth.)

Mr. Lyon: Your Honor, if we are not going back to his original case, are we going to reopen and retry—— [590]

The Court: Hasn't he testified——

Mr. Christie: Your Honor——

The Court: Just a moment.

Mr. Christie: I am sorry.

The Court: Hasn't he testified that the hot wall was the problem, the problem was to get the heat capacity there without burning the house down, I suppose, and this method he adopted was his method of solving it?

Mr. Christie: Your Honor, he never had an opportunity to testify completely on this point on prima facie. This goes to the issue of validity of the invention.

The Court: I understand.

Is there any issue here about the problem?

I suppose it is ever present in the case.

Mr. Lyon: We don't deny the hot wall problem.

The Court: To get the heater in the smallest possible space with the largest possible capacity, and so as to heat the room without burning the house down, isn't that roughly the problem?

Mr. Christie: That is only part of the problem, your Honor, and I wouldn't undertake to state it myself. Mr. Hollingsworth——

The Court: Very well. We will save time by allowing him to state it.

Mr. Lyon: Your Honor, isn't this—what we are

(Testimony of John H. Hollingsworth.)

doing now [591] is reopening their prima facie case.

The Court: While we are talking about it, probably he could answer it.

The Witness: I believe the only problem that we encountered that I haven't covered in earlier testimony would be that of efficiency and the effect of flue height on the efficiency, and the extent to which that was a problem to us and to the industry. The problem was more than just a hot wall problem in the respect that the solution to the efficiency problem, and the solution to the hot wall problem were counter to each other.

The Court: Can you say it any better, Mr. Hollingsworth, than you have said it here in the patent? Haven't you stated the problem in the patent and stated your solution of it?

The Witness: Yes, your Honor.

Mr. Lyon: And we spent an hour on it on their direct case, on this very point.

Q. (By Mr. Christie): Mr. Hollingsworth, one more question. Will you explain the problem that you encountered with the changing of flue heights, varying flue heights, and how you solved that problem, if you did.

Mr. Lyon: Your Honor, that is the very thing that is put in the patent. He spent an hour on direct examination on it, an hour on cross examination, and now we are going to do it all over again, are we? [592]

The Court: Let's ask Mr. Hollingsworth.

(Testimony of John H. Hollingsworth.)

Have you said it?

Most of us can say things in writing better than we can say it extemporaneously or orally.

The Witness: I don't believe I have mentioned how——

The Court: Then you tell us about that.

Mr. Lyon: Then it is not in the patent.

The Court: He may describe something that existed in the art at the time.

The Witness: The hot wall problem was reduced—this I have said in the patent, but I have to preface my remarks with this—the hot wall problem was reduced by most people by introducing additional relief air into the draft hood. We did not recognize the degree to which this affected the efficiency of the appliance out in the field. No one recognized it for a long time. We were quite puzzled by this problem, because we found that we were getting complaints from customers in the field regarding lack of heat.

The Court: By giving the relief at the draft hood, the heat went out the flue, didn't it?

The Witness: Yes. But the reason we didn't recognize it is because we had not at that time recognized, principally on two-story installations, that the extreme flue height was the very damaging factor.

The Court: In what way? [593]

The Witness: In that the chimney action that was available, due to that added flue height, was substantially higher, and therefore the amount of

(Testimony of John H. Hollingsworth.)

relief air that was drawn into the relief opening of the draft hood went up very markedly. And because our American Gas Association tests were conducted at that time with only four feet of vent on top of the appliance, we were not duplicating the actual conditions that existed in almost every instance in the field. We did not recognize that the 70 per cent efficiency that we were assuming was correct for the appliance was actually firing air under actual installed conditions in most instances.

The Court: Is it an over-simplification, Mr. Hollingsworth, to say that your problem was to save that heat from waste out the flue, put it into the room, utilize it, and at the same time cool the wall?

The Witness: No, at this point that would not be an over-simplification. It, of course, would be at the time of trying to understand the problem, because we had to find a solution to it.

The Court: It is, of course, always easier to look back at it.

The Witness: Yes.

Mr. Christie: I would like to have a piece of pipe here marked as Plaintiff's Exhibit next in order. [594]

The Court: Exhibit 47 for identification, Mr. Clerk?

The Clerk: Yes, your Honor, 47 for identification.

(The object referred to was marked Plaintiff's Exhibit 47, for identification.)

Mr. Lyon: If they are going to introduce this——

(Testimony of John H. Hollingsworth.)

The Court: Let's wait and see.

Mr. Christie: At the conclusion of Mr. Kice's examination yesterday, your Honor, I asked him if it was a fair statement of his testimony that the cross-sectional area of the radiator or flue in his economizer was the same size as the flue that had been used previously in this sort of installation, and he said yes. I am pretty sure he said it on direct examination, also, although I cannot now point to chapter and verse. We will look it up, if necessary. We want now to introduce a piece of that type of flue.

I will ask Mr. Hollingsworth to tell me what this piece which I have had marked Plaintiff's Exhibit 47, for identification, is.

The Witness: This is a piece of a short section of Metalbestos flue commonly called Type B vent or Type BW, which we were using in the laboratory for test purposes.

That is the reason for the test tube on the side of the exhibit.

It is a piece of Metalbestos flue pipe that we obtained on the market as it was manufactured by the Williams-Wallace [595] Company, who produce this type of vent.

The Court: By "we" you mean who?

The Witness: My staff, or my department.

The Court: When you were in the process of developing this device described in the patent in suit?

(Testimony of John H. Hollingsworth.)

The Witness: Not this particular piece of vent, no, sir. I don't know when we purchased that.

Q. (By Mr. Christie): Is this the type of vent that was identified as Type B Metalbestos flue or Type B vent, at the time, say, in '47, '48, or '49, when this sort of pipe was connected directly to the lower box?

A. It is in this respect, that the inside area of the flue passageway is the same. There may be minor constructional differences that have taken place, and the means of attachment.

Q. Have you measured the cross-sectional area of that pipe? A. Yes, I have.

Q. What is it?

A. As I measure it, it is 13.1 square inches.

Q. Now, have you compared that with the cross-sectional area of the pipes in the economizers or secondary heat exchangers identified as Plaintiff's Exhibits 24-B and 25-A, the first being the four-foot economizer and the second the three-foot economizer? [596]

A. Yes, I have. Those areas are nine and a quarter square inches on both.

Mr. Lyon: This testimony is objected to as mere surmise. He doesn't know whether this is the piece of pipe that the Coleman Company and the others were using. He said he bought this for experimental use.

Q. (By Mr. Christie): Do you know of your own knowledge, Mr. Hollingsworth, that this pipe of

(Testimony of John H. Hollingsworth.)

that size was what was used for vents as Type B vent, back in '47, '48, or '49?

Mr. Lyon: By whom?

Mr. Christie: By the industry.

Mr. Lyon: It is immaterial in this case if it was used by——

The Court: Specify the Coleman Company, then. By the Coleman Company and others.

The Witness: Yes, it was. I know this is so, because the internal cross-sectional area of four-inch oval vent, of which this is——

The Court: "This" being Exhibit 47?

The Witness: This being Exhibit 47,—is an example. It is specified by codes and ordinances to be of a certain area, within reasonable limitations.

The Court: And Exhibit 47 has a cross-sectional area of how much, how many square inches? [597]

The Witness: Slightly over 13 square inches.

The Court: And the flue in the four-foot economizer——

The Witness: The flue in the four-foot economizer and three-foot economizer has 9.28 square inches.

The Court: How about Exhibit 20-A, the secondary heat exchanger of Holly?

The Witness: I believe that was 7.09.

The Court: Can you give it to us percentage-wise now?

Mr. Lyon: Your Honor, that still is smaller in

(Testimony of John H. Hollingsworth.)

size than his alleged area of the lower. It is just exactly as Mr. Kice stated.

The Court: I don't know what weight it may have.

Mr. Lyon: It is immaterial.

The Court: Overruled.

Can you give us, roughly, the percentages?

The Witness: Yes. The area of the secondary—the radiator in the secondary heat exchanger of the Holly device is slightly over 50 per cent of that of standard BW vent.

The Court: Exemplified by Exhibit 47?

The Witness: Exemplified by Exhibit 47. The area of the Coleman secondary radiator, as compared to the area of vent as exemplified by Exhibit 47, would be approximately 30 per cent. Excuse me. 65 per cent. Two-thirds of the area.

The Court: Do you offer Exhibit 47 in evidence?

Mr. Christie: I offer Exhibit 47 in evidence, your Honor.

The Court: Received in evidence.

Do you have an objection to this?

Mr. Lyon: That it is immaterial.

The Court: Overruled. Received in evidence.

(The exhibit referred to, marked Plaintiff's Exhibit 47, for identification, was received in evidence.)

Q. (By Mr. Christie): Mr. Lyon has asked me to ask Mr. Hollingsworth some questions on direct, bearing on the times at which the various models of the Coleman furnace—of the Holly furnace,

(Testimony of John H. Hollingsworth.)

excuse me—with the heat exchanger, exemplified by Exhibits 20 and -A, -B, and -C, and Exhibit 44, were first put on the market.

Do you know that, Mr. Hollingsworth?

A. If I understand your question correctly, the heater exemplified by Exhibit 20 was the first one that was put on the market.

Q. When was that?

A. In 1950, I believe. The other heaters, which make up the rest of the series, as I call it, or the other four basic models——

The Court: Four or three?

The Witness: The other three basic models, followed within approximately a year in spaced intervals, as we could get [599] them approved by the American Gas Association and into production. The exact time I would not recall, but I am quite certain that all four models comprising the series were in production in 1951.

Mr. Christie: That is all, your Honor.

Cross Examination

Q. (By Mr. Lyon): You have testified that you put smoke, this titanium dioxide, into the back of these furnaces at Wichita? A. Yes.

Q. You didn't put that in the outlet, did you—I mean in the inlet of the furnace, did you?

A. I put it in the area, inlet area that supplies the space behind the box.

Q. You actually ejected it into a particular place in the furnace?

(Testimony of John H. Hollingsworth.)

A. No, I couldn't eject it, because it was just smoke on a wand.

Q. How did it get in there?

A. The air movement through the base of the heater and up behind the heater carried that smoke with it.

Q. Do you mean to say that you held this wand in front of this furnace at the opening?

A. No. I said I held it inside the opening at the [600] base of the heater in the passageway that supplies the back of the box.

Q. Actually, didn't you stick it between the wall and the furnace right alongside here?

A. Not up there, no, sir.

Mr. Lyon: I should like to point out to the court photographs here, I think in these it shows, and if not the testimony does——

The Court: Exhibit R is it?

Mr. Lyon: No, it doesn't appear in this. I will have to put a witness on.

Q. (By Mr. Lyon): You actually burnt the sides of the furnace up here with that wand when you put it in?

A. That smoke that was on the side of the furnace up there was the smoke that was introduced through the leakage points on the side of the panel that I testified to earlier. When I placed the smoke wand in front of that leakage gap, smoke came in across the side of the box and deposited there. That would show in the photographs. very probably.

(Testimony of John H. Hollingsworth.)

Q. Mr. Hollingsworth, are these apparatuses sealed hermetically? A. No.

The Court: Do you mean for the test or for the field?

Mr. Lyon: I mean for ordinary use.

The Witness: No, of course not. [601]

Q. (By Mr. Lyon): Do all of these grilles fit tightly so there is no leakage around the sides of them?

A. They fit substantially tight. I would say that in some instances there is a gap of as much as a thirty-second, depending upon how accurate the surface of the wall might be.

Q. Would you say that for the purpose of your patent, if they are inserted with a gap around them, that that would render your device inoperative?

A. It wouldn't render the device inoperative.

Q. Would it accomplish the functions that are taught in the patent, if there was any gap around the edge of the outer shell?

A. Yes, because the amount of air that came in there would not upset the basic function of the appliance.

Q. Then, if you left a small crack there it would upset the basic function of the appliance as patented? A. No, it would not, I say.

Q. Then why did you say if there was a small crack around the defendant's device, that it was not operating in the condition that you say your device can operate still?

A. I mentioned the gap only for this reason:

(Testimony of John H. Hollingsworth.)

that it substantially exceeded the gap that you would normally expect to see in the field, by quite a bit.

Q. How big was that gap? [602]

A. I believe that is in the deposition. I don't recall the exact dimension. It was substantially larger than that that I had ever seen on any heater installed in the field, and that gap would, under test conditions, where an attempt was made to determine flow rates, would certainly upset the test results. [603]

Q. Then it would completely change the function of the machine if it upset the flow?

A. It wouldn't change the function of the machine. It would change the order of magnitude of the results.

Q. Well, does your patent have any statement as to magnitude of results? A. No.

Q. Are you relying on a specific amount in it?

A. It is implied. I don't believe I understand the question.

Q. It is not stated. Well, you were saying that if the defendant leaves a crack on here, that he is no longer functioning in the manner of your patent, aren't you?

A. I said that it would not change the basic function of the device, but that it would vitiate the test results if I were attempting to accurately determine the air flow.

Q. Then with that crack around there it would no longer infringe your patent, would it?

(Testimony of John H. Hollingsworth.)

A. It hasn't changed the basic function of the appliance.

Q. Then the test is perfectly legitimate no matter how big the crack is, because the function and the operation is still the same?

A. It would depend on who was attempting to evaluate those test results. I would say the test would certainly not [604] be legitimate on that basis.

Q. All right. Now, why, Mr. Hollingsworth, when the defendant leaves a small crack in some place in his device do you presume that he gets a perfectly good draft and accomplishes a perfectly good result, when the plaintiff leaves one opening, why, that's just mechanical tolerances necessary because you can't make it any better—why isn't the same thing true with the defendant's devices?

A. It is true with the defendant's devices. I agree completely. But I certainly wouldn't leave that gap on Exhibit 44, as small as it is, I would not leave it in that position if I were trying to run some carefully controlled laboratory tests because I would feel that would upset some of the results, even to a minor degree.

Q. Isn't that the way it is used in the field? You testified that is the way it is used when it is installed. Isn't that the correct manner?

A. I testified that there was normally a 32nd to a 16th of an inch production tolerance gap provided there, for obvious production reasons.

Q. Now, have you measured the area of the in-

(Testimony of John H. Hollingsworth.)

take at points 7 and 8? Would you please actually measure that area?

A. Yes. As I measured it, I measured the area and found that the gap was $5/32$ of an inch, as nearly as I could determine by taking an average. I found that the length of [605] the slot was $5\frac{3}{4}$ inches, as nearly as I could determine the average; and that there are one, two, three, four, five—ten slots.

Q. Then that comes to approximately 36 square inches?

A. Not according to my calculations.

Q. Well, I will call the court's attention—I will measure the device. This device is six inches to this grille long by $2\frac{1}{4}$ wide. And there are two of them.

A. But that is not net free area.

Q. You have got the small deduction of the width of this metal which is approximately what scale?

A. The only entrance area available into the—in through the louvres with the actual opening provided through which I can see light. That is the area that I measured.

Q. Well, isn't this all opening except for the width of these louvres?

A. No, most certainly not.

Q. Why not?

A. Because I can go from two extreme conditions, from the louvres being completely closed to full wide open. These louvres are in a partially closed position.

(Testimony of John H. Hollingsworth.)

Q. They still leave the same area open.

A. No, they do not.

Q. All right. Now, you have measured the area on top of here and taken the whole width. Didn't you ignore the [606] center pipe when you measured the width that it could come back and up into the thing?

A. No, I didn't. I considered that the——

Q. Just a minute. You said this was 13 by 3/16 would be the area. Now, did you subtract the width of the pipe in the way?

A. I also said that I considered that the area that I neglected up the sides of the box provided between the box sides and the studs was essentially equivalent to the restriction that would be provided by the tube coming up through the box. I think that's a conservative estimate.

Q. And yet there is no way that any air can get up the sides of this heater.

A. Yes, there is.

Q. You are just assuming. Will you show the court, please, where it can get in there? I want to see.

A. (Witness complies.)

Q. No. Put the shell on it and show us where you can possibly get any air up to the top of that box with the shell on it and the studs in place.

A. I would be glad to.

With the shell in place, we have basically the same condition as I described previously on 44, Exhibit 44, with one exception; that the area provided in the——

(Testimony of John H. Hollingsworth.)

Q. Now, have you got all the parts again—let's get [607] all the parts of this machine together before you point out areas that don't exist when you put them together.

A. Let me complete my answer. The space provided between the studs and the sides of the box, this area defined by the wall width, and the dimension between the wall and the side of the box is open and free to come—to be—to allow air to come over the top of the box.

The Court: Are you referring to the space that is defined by those ribs?

The Witness: I am referring to the space, your Honor, that is the difference between the 13 inches and the normal stud width, which is approximately $\frac{5}{8}$ of an inch.

The Court: Let the record show we are referring to Exhibit——

The Witness: 24-A.

Mr. Lyon: 24-A and 24.

Q. (By Mr. Lyon): Now, is that all of this heater?

Mr. Christie: Your Honor, may I assist the witness in putting this heater together, because obviously it is more than the man can hold all at once.

Mr. Lyon: I have no objection.

The Court: Yes, if he needs any assistance.

The Witness: I think I can demonstrate——

(Testimony of John H. Hollingsworth.)

Mr. Lyon: I would like to have the whole machine put together. [608]

Now, put the 3-foot economizer on there. That's what we are talking about.

The Witness: The area that I was referring to is the area——

Mr. Lyon: Please, Mr. Witness, let's put the machine together——

The Court: Let's let him explain his answer, if he wishes.

Mr. Lyon: ——so we can see something not out in space.

The Court: Let the witness explain his answer.

The Witness: The area that I was referring to was the area defined by the 13-inch width times the quarter inch height provided here. I took that area because I assumed this, that the restriction provided by this tube to the back was more than compensated by the area that was available from the sides, and that I felt that I was justified in taking this area defined by the width of the box times the gap between the base of the economizer and the top of the box.

The Court: Does that answer your question, Mr. Lyon?

Mr. Lyon: It doesn't even start to.

The Court: Put another question.

Mr. Lyon: I asked the gentleman to assemble it and show us these openings.

The Court: You can't see the openings if he puts the shell on it. [609]

(Testimony of John H. Hollingsworth.)

Mr. Lyon: That's exactly my point. They are not there, your Honor.

The Witness: I think I can clarify that. I believe what Mr. Lyon is referring to are these clips here which seal the space in the panel side rails which normally would move air. That air is allowed to relieve itself out grilles 9 and 10.

These clips at the top of Exhibit 24-A seal those conduits to the top of the box so that air from those conduits cannot get into the economizer. However, they do not seal the area here that's defined by the stud space.

The Court: You are referring to the area, the depth of that overlapping flange downward on to the top—over the side, rather, of the lower box with the 3-foot economizer installed, is that it?

The Witness: That is correct, your Honor.

The Court: That's the only area you are referring to as far as the sides are concerned?

The Witness: Yes, your Honor.

The Court: And the depth of that would be whatever distance there might be between the stud and the rib of the box, or the side of the lower box?

The Witness: Yes, except that the other dimension which has just been described as the width of the flange at the base of the second box is not quite right in that it also includes the normal plaster thickness or dry wall thickness, [610] which is anywhere from a half inch to an inch. So it would be somewhat wider than that flange.

Mr. Lyon: Now, if the witness will please put

(Testimony of John H. Hollingsworth.)

the machine together, I would like to point out to your Honor there is no such opening as he has testified to; that the only place air can enter this economizer from the back or the sides is through that place that he measured that is obstructed by the center flue.

The Court: All right. Now, is it assembled to your satisfaction?

Mr. Lyon: The header comes right there (indicating).

Q. (By Mr. Lyon): Now, is not the only air that can come up the side go in under here?

A. The air that comes up the side goes in under there, yes.

Q. That's the only opening into there from the sides?

A. That's what I said, plus the thickness of the plaster.

Q. All right. Now, that isn't an opening out in here some place, is it (indicating)?

A. It communicates with this (indicating).

Q. It has to come up there and come out this same opening that you were measuring before?

A. Yes.

Q. And, therefore, that is still obstructed by this [611] pipe.

A. But the perimeter of the area that supplies that is greater than the area——

Q. It still comes out that one hole that is plugged by that pipe—substantially three-quarters of that area is?

A. I can't agree with that.

(Testimony of John H. Hollingsworth.)

Mr. Lyon: Do I make myself clear, your Honor, on these——

The Court: I think I see the situation. It is just a question of whether the compensation that Mr. Hollingsworth allows is a fair compensation.

Mr. Lyon: That is right.

Q. (By Mr. Lyon): Now, will you measure this area across here and here (indicating), and give us the square inches of actual area that air can come into the front?

The Court: You mean excluding the flue?

Mr. Lyon: Excluding the flue.

Q. Now, what are those dimensions?

A. $3\frac{1}{2}$ inches on each side. So that would be 7 times $\frac{1}{4}$ of an inch, or $1\frac{3}{4}$ square inches.

Q. $1\frac{3}{4}$ square inches. Then it's approximately, the outer grille is approximately 15 to 20 times larger than that?

A. Oh, no.

Q. Oh, no? A. No. [612]

The Court: The outer grille? You are referring to points 7 and 8?

Mr. Lyon: That is right. 7 and 8 measure approximately 30 square inches; this one approximately $1\frac{3}{4}$ by the witness' own measurement.

The Witness: 7 and 8 are very definitely in the order of magnitude of 9 square inches as compared to 1.75. That's on the order of 1 to 5.

The Court: That would be 20 per cent, roughly 20 per cent instead of 25 per cent.

The Witness: Yes, your Honor.

The Court: I think I have it.

(Testimony of John H. Hollingsworth.)

Mr. Lyon: Well, I don't. I insist they are approximately——

The Court: No, but I have your contention and I have the witness' contention. I think I see what the point of difference is.

Q. (By Mr. Lyon): Now, this smoke that you introduced into the sides of this heater in these tests in Wichita, that was hot, wasn't it?

A. The smoke was hot?

Q. Yes. A. No, it wasn't.

Q. You inserted titanium——

A. Tetrachloride. [613]

Q. ——tetrachloride, and that reacts when it hits the air to make an oxide, doesn't it?

A. Yes.

Q. And there is a heat reaction, isn't there?

A. Yes.

Q. And that actually burned the sides of the furnace when you did it?

A. Oh, no. No, the condition that would exist on the sides of the furnace would be a corrosive condition, due to the acids that are produced in that reaction.

Q. Now, is that reaction to the oxygen condition, is that a cold reaction; no heat developed?

A. There is heat developed in any reaction like that.

Q. Well then, therefore, that is not a cold smoke.

A. By the time it is in the position where I would observe it, I would consider it a smoke that was so nearly the same temperature as the ambient

(Testimony of John H. Hollingsworth.)

gas conditions, that I would consider it not heated.

Q. And that was forced in at the sides, though, it wasn't allowed to go into the front of the opening?

A. It wasn't forced in, no.

Q. How did it get in? You didn't put it in the main opening to the furnace, did you?

A. Yes.

Q. Down in front?

A. I introduced it—— [614]

Q. Oh, you stuck your wand up in there, yes.

A. I put my wand in through the opening into a position where the air moved up around the box, yes.

Q. Yes, I remember how it was done. You had a hook on the wand and you reached in and stuck it up this way, didn't you?

A. About two or three inches, yes.

Q. It wasn't out here and allowed to go in the normal paths of air drawn into this furnace, though, was it?

A. On that particular test, no.

Q. Was there any test that you have ever made that you allowed the furnace to operate with an outside source of smoke and didn't insert or inject it in some way?

A. Oh, yes, many, many times; not at the Wichita tests.

Q. None that you have testified today, though, or at any time in this trial?

A. I conducted tests during——

Q. I asked you any of the tests that you have

(Testimony of John H. Hollingsworth.)

testified at this trial, whether those tests were made by allowing the smoke to get in there in the normal way, or was it injected by someone?

A. Of my own tests?

Q. Yes.

A. The specific ones that I have been testifying to today, no. [615]

Q. How about those that you testified to the other day?

A. I don't recall that testimony.

Mr. Lyon: I think that is all of this witness.

Mr. Christie: Your Honor, during Mr. Lyon's cross examination, he gave the impression, by reference to Defendant's Exhibit R, that the photographs which appear were taken at the Wichita tests. I can call the witness on this point, but I am sure there will be no disagreement that the pictures in Exhibit R were taken prior to the tests by the defendant when the plaintiff and his representatives were not present.

Mr. Lyon: I will stipulate to that.

The Court: Very well. Do you accept the stipulation?

Mr. Christie: Accepted. [616]

* * * * *

WARREN BLAZIER, JR.

recalled as a witness on behalf of the defendant, having been previously duly sworn, was examined and testified further as follows:

Direct Examination

Q. (By Mr. Lyon): Mr. Blazier, these tests that were made at Wichita, were you present when Mr. Hollingsworth made these tests with this titanium tetrachloride?

A. Yes, I was. They were part of my cross examination by Mr. Christie.

Q. They were? A. Yes.

Q. Was that smoke, the heat put in, forced into the machine?

A. Yes. And I testified to that in my deposition, during that cross examination.

Mr. Christie: Your Honor, it seems to me this is simply a repetition of what is in Mr. Blazier's deposition. I see no—this is pure repetition on counsel's part.

Mr. Lyon: I have just one more question and then I will be through.

The Court: Very well.

Q. (By Mr. Lyon): Mr. Blazier, when they put this wand in there, didn't it leave marks on the back and on the sides [617] of the heater?

A. That is correct.

Q. Now, about approximately where would you say those marks were left, using Exhibit 24? Would you take a piece of chalk and mark on there where those, either burns or rust or whatever was left?

(Testimony of Warren Blazier, Jr.)

A. There were stains that I recall that were left on the sides of the lower box in this region—which I will mark (indicating).

Q. In chalk? A. In chalk.

Q. On the side of the Exhibit 24?

A. Yes.

Q. Now, was that on one side or both sides?

A. I don't recall at the moment. I think the test was done on just the one side, as the demonstration.

The Court: What, in your opinion, caused the marks or the stains?

The Witness: In the immediate vicinity of the smoke wand, which in this case was a titanium tetrachloride solution—well, I will say it this way: The thing that produces the smoke, when you use titanium tetrachloride there is a reaction of the titanium with water vapor in the air and you get titanium dioxide, which is white pigment, and hydrochloric acid. Now, the heat of reaction is quite high and [618] there is a lot of spitting of particles as this reaction takes place. And there is a deposit that can be built up just due to the white pigment in the smoke. And on this test that I witnessed, the wand was hooked so that it could be inserted in behind the unit and up in the space between the side of the case and the stud space.

The Court: These black marks—were they black or white?

The Witness: These were white in that case—white and black. I mean, it was a stain, and it is

(Testimony of Warren Blazier, Jr.)

difficult to say just what the proper description of the color would be.

Q. (By Mr. Lyon): Now, were there any more than the one you have indicated here?

A. There was a number of stains around the sides of the outer case during the period that he was checking to see if there was some air entrainment in the space around the case and the wall.

Q. Now, this reaction of titanium chloride, doesn't it kind of expel the smoke, like this, off the wand (illustrating)?

A. It's a highly active reaction, yes, sir.

Mr. Lyon: I think that's all, your Honor.

Mr. Christie: I have another question of Mr. Blazier. [619]

Cross Examination

Q. (By Mr. Christie): Mr. Blazier, I am referring now to Defendant's Exhibit—your deposition taken in Wichita—Exhibit Q in evidence.

May I hand it to the witness?

At page 88 of the deposition, and I will read it to you. Now, beginning about half way down page 88:

“Q. Now, Mr. Blazier, I am going to ask Mr. Hollingsworth to repeat that test with heater No. 68. I would also like to ask what assurance we have of what we have observed on units 1 and 2, whether that has been observed with the correct input conditions.

“A. It is correct for those heaters.

“Q. Now, would you step over here, Mr. Blazier,

(Testimony of Warren Blazier, Jr.)

and tell me what you see, with the wand placed in the lower right-hand corner?

"A. With the wand placed in the lower right-hand corner at the back of the heater casing * * *

"Mr. Hollingsworth: Would you look at the wand again?

"Q. (By Mr. Christie): Will you explain the position of the wand?

"A. I see what it's doing; it is all right. I [620] wanted to be certain that he was not touching the electric wiring, which might give him a bad shock.

"Q. Tell me what you observed.

"A. I observed that the wand was placed just inside of the heater chamber at the base of the heater. I noticed that flow from the wand started to flow up the stud space but was drawn into the lower box.

"Q. Where is the smoke coming out?

"A. And I see the smoke coming out of the lower box main outlet grille, where it should, on the front. I see a small amount coming out of the lower box outlet back of the grille."

Now, you agree that this is your testimony, isn't it?

A. This is part of it, yes.

Q. And you do not mean now to change this portion of your testimony, or any other testimony that you gave at Wichita?

A. No, sir, definitely not.

This is not the only reference, however, to the position of the wand on your cross examination of

(Testimony of Warren Blazier, Jr.)

me. This is one test that we haven't even covered yet today. This is on the Model 68 with the rear outlet, and the test at that time was to show the smoke coming out of the rear outlet, which it did.

Q. But you are content to rest on your testimony? [621]

A. I will stand by my testimony in this deposition, Mr. Christie. [622]

* * * * *

Mr. Lyon: I was coming to that.

The plaintiff has not had the decency to inform this court that Mr. Landsberg is in the employ of a company of one of plaintiff's counsel.

The Court: That does not show in the record, does it?

Mr. Lyon: No.

The Court: That was not asked Mr. Landsberg in cross examination.

Mr. Lyon: No, it doesn't. But I will ask Mr. Christie if it is not true, right now.

Mr. Christie: What is your statement?

Mr. Lyon: That Mr. Landsberg is an employee of one of the companies on which you are on the Board of Directors and a stockholder?

Mr. Christie: Mr. Landsberg is an employee of the Consolidated Engineering Corporation. I happen to be on the Board of Directors of that corporation.

I assure you that I have no influence over Mr. Landsberg; that I exerted no influence over Mr.

Landsberg; and I think this is highly improper on the part of Mr. Lyon.

He could have well asked Mr. Landsberg if I had directed him to testify. [696]

I will tell you, your Honor—and be sworn if necessary—that I did not; that I simply told Mr. Landsberg to go out and make a fair determination of this thing and bring us the results. [697]

* * * * *

[Endorsed]: Filed April 1, 1955.

PLAINTIFF'S EXHIBIT No. 11

[Letterhead of Dawson, Tilton & Graham]

HD:m

April 15, 1953

James B. Christie, Esq.,
595 East Colorado Street,
Pasadena 1, California

Dear Mr. Christie:

Re: Holly Manufacturing Company

Patent No. 2,602,441—

The Coleman Company, Inc.

I have forwarded your letter of March 3, 1953, to The Coleman Company, Inc., and have received a communication from the company with respect to tests which it has performed.

I am advised that when the unit is properly installed, the air flow from the space about the lower box into the upper box is inconsequential. Of course, to make the structure hermetically sealed

would require extremely tight joints, which are difficult to get in a plaster wall. It was felt by the Coleman technical people, however, that the trace of air flowing upwardly was inconsequential.

I have now been advised by Coleman that in view of the comments in your letter, they have decided to make a further change in the structure in which the upper unit is seated within the lower unit so that there is no possibility of any flow of air from the space about the lower unit into the upper box. I believe that this will satisfy your client and I shall plan to send you a copy of the drawing of the new structure in the very near future.

Yours very truly,

DAWSON, TILTON & GRAHAM

/s/ By HORACE DAWSON

cc The Coleman Company, Inc.

Wichita 1, Kansas

Attn: Mr. Jess L. Moore, Jr.

PLAINTIFF'S EXHIBIT No. 12

[Letterhead of Dawson, Tilton & Graham]

HD:m

June 4, 1953

James B. Christie, Esq.,
595 East Colorado Street,
Pasadena, California

Dear Mr. Christie:

I am enclosing a sketch of the Coleman wall type burner. The Coleman Company has given me working drawings, but in order to make the matter clear, it seemed to me better that a drawing should be prepared similar to the one shown in the Hollingsworth, et al. patent, and, accordingly, I have had such a drawing made.

In the drawing, you will note that the second or upper box 10 is closed at its bottom and that it is open only at its forward intake end 11. None of the air from about the lower box is thus able to enter the upper box 10. Instead, the air that enters the upper box 10 is room air passing through the entrance 11 and extending upwardly about the pipe 12 and outwardly through the discharge opening 13.

I am enclosing also photostatic copies of an advertisement of the Metalbestos Vent Assembly, which advertisement came out several years prior to the filing of your client's application for patent. The advertisement shows a wall heater, and more particularly a vent structure which is employed with a wall heater. The Metalbestos Wall Heater Vent Assembly is used with the common wall heater

in which there is a central radiator, a burner for heating it, a stack, a draft hood provided with a relief opening into the room, and the usual outlet and inlet passages. Over such a wall heater is placed the Metalbestos "Wall Heater Vent Assembly", which has an inner radiator communicating with the stack of the wall heater and about the radiator is a second box having inlet parts for receiving air in the lower part of the chamber. Any air leaking upwardly from about the lower box will pass into the second box of the Metalbestos Wall Heater Vent Assembly. We call this structure to your attention because your client has been concerned with the fact that a trace of air may leak past any barrier placed in the studding space and find its way into the upper box. A studding space, with the rough plaster therein, is, of course, difficult to seal, and in the prior Metalbestos installations, it is found that a small amount of air passes upwardly around the barrier and into the second box.

Yours very truly,

DAWSON, TILTON & GRAHAM

/s/ By HORACE DAWSON

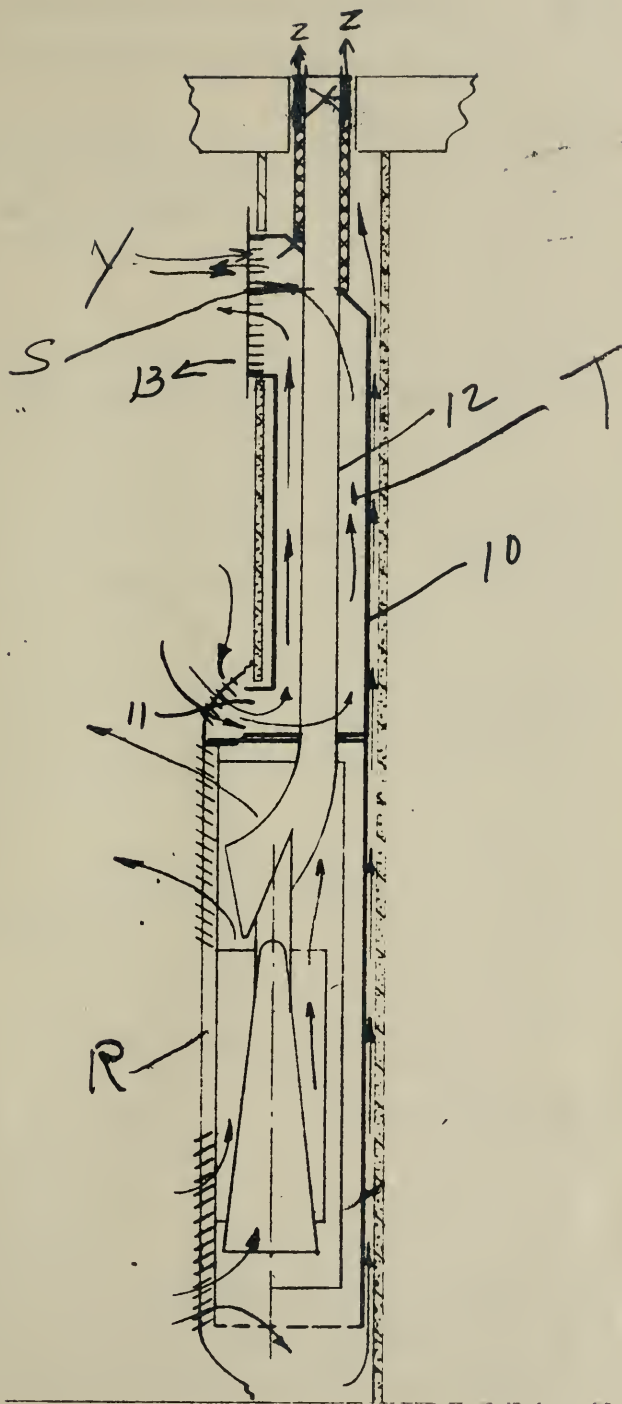
Encs.

cc The Coleman Company, Inc.

Wichita 1, Kansas

Attn: Mr. Jack Kice

4-54
Plaintiff's
Exhibit 1
MS



PLAINTIFF'S EXHIBIT No. 15

Mr. Stanley Johnson February 23, 1954
Holly Manufacturing Company
875 South Arroyo Parkway
Pasadena, California

Dear Stan:

I have enclosed for your file a copy of our letter to Thomas Gressett in Denver concerning the article appearing in the Daily Journal.

We have not had an opportunity to talk to Mr. Lyon, local counsel for the Coleman Corporation, concerning this matter. However, we did notify his secretary of the action we were taking.

I trust that this will take care of the matter satisfactorily. If you have any further suggestions would you please let me know.

Sincerely,

Richard B. Hoegh

RBH:eca—Enclosure

PLAINTIFF'S EXHIBIT No. 16

Mr. Thomas G. Gressett February 19, 1954
2705 South Gilpin Street
Denver 4, Colorado

Dear Mr. Gressett:

Pursuant to the understanding we reached by telephone this afternoon, we are sending you the following proposed statement which you agreed to

have published in the Daily Journal in Denver:

"Thomas G. Gressett of the Thomas G. Gressett Company retracts the statement published in the February 13, 1954 issue of the Daily Journal and in particular that portion of the statement as follows:

'Holly has won four previous suits contesting Coleman's heat economizer ideas, claiming they were developed from Holly plans'

"Mr. Gressett points out that Holly has not won four previous suits contesting Coleman's heat economizer ideas; the Holly Company is suing the Coleman Company in the Federal District Court for the Southern District of California, alleging that Coleman furnace models No. 67, No. 68 and No. 69 infringe Holly patent No. 2,602,441. It is expected that the suit will be tried sometime in late 1954."

We trust that the foregoing suggested retraction will be given the same circulation as the previous story published in the Daily Journal.

Yours very truly,

Richard B. Hoegh

RBH:eca

PLAINTIFF'S EXHIBIT No. 18

In the United States District Court for the Southern District of California, Central Division

[Title of Cause No. 15,886-WM.]

DEFENDANT'S ADMISSIONS AND DENIALS
IN RESPONSE TO PLAINTIFF'S REQUEST FOR ADMISSIONS

On December 15, 1954 plaintiff served upon the defendant its Request for Admissions. Defendant admits and denies said request as follows:

I.

Request No. 1:

That defendant's wall heaters designated as models 64, 67, 68 and 69 include a first box adapted to be mounted in a wall of a room to extend upward therein from a level near the floor of the room to a level part way to the ceiling.

Defendant admits this request.

II.

Request No. 2:

That defendant's wall heaters designated as models 64, 67, 68 and 69 include a first hollow radiator mounted in the box and spaced from the walls thereof.

Defendant admits this request.

III.

Request No. 3:

That defendant's wall heaters designated as models 64, 67, 68 and 69 include means for burning fuel in the first radiator.

Defendant admits this request.

IV.

Request No. 4:

That defendant's wall heaters designated as models 64, 67, 68 and 69 include means connected to the lower portion of the first box for introducing air thereinto near the floor of the room.

Defendant admits this request.

V.

Request No. 5:

That defendant's wall heaters designated as models 64, 67, 68 and 69 include means connected to the upper portion of the first box for discharging air into the room from the box near its top.

Defendant admits this request.

VI.

Request No. 6:

That defendant's wall heaters designated as models 64, 67, 68 and 69 include a second box adapted to be mounted in the wall above the first box to extend from a level just above the first box to a level near the ceiling.

Defendant admits this request.

VII.

Request No. 7:

That defendant's wall heaters designated as models 64, 67, 68 and 69 include a second hollow radiator disposed in the second box and spaced from the walls thereof, the horizontal cross section of the second radiator being substantially smaller than that of the first radiator.

Defendant denies this request.

VIII.

Request No. 8:

That defendant's wall heaters designated as models 64, 67, 68 and 69 include means connected with the upper portion of the second box for discharging air from the second box into the room just below the ceiling.

Defendant admits this request.

IX.

Request No. 9:

That defendant's wall heaters designated as models 64, 67, 68 and 69 include a draft hood provided with a relief opening into the room and connecting the top of the first radiator with the bottom of the second radiator, said second hollow box having an inlet opening adjacent the bottom thereof and adapted to receive air flowing upward outside the first box and inside the wall.

Defendant denies this request.

X.

Request No. 10:

That defendant's wall heaters designated as models 64, 67, 68 and 69 include a flue connected to the top of the second radiator.

Defendant admits this request.

XI.

Request No. 11:

That defendant's wall heaters designated as models 64, 67, 68 and 69 include apparatus as set forth in requests 1 through 10 above, provided with a baffle disposed in the first box behind the first radiator and spaced from the radiator and also from the rear wall of the box.

Defendant denies this request.

XII.

Request No. 12:

That defendant's wall heaters designated as models 64, 67, 68 and 69 include apparatus as set forth in requests 1 through 10 above, provided with a baffle disposed in the first box behind the first radiator and spaced from the radiator and also from the rear wall of the box and the baffle, said conduit being open at the bottom and also at the top and in communication at the top with the interior of the first box.

Defendant denies this request.

XIII.

Request No. 13:

That defendant's wall heaters designated as models 64, 67, 68 and 69 include apparatus as set forth in requests 1 through 12 in which the second radiator is composed of a shallow front member and a shallow rear member.

Defendant denies this request.

XIV.

Request No. 14:

That the wall heaters manufactured and sold by plaintiff and designated as the "NarrowWall" embody the inventions described and claimed in the patent in suit.

Defendant denies this request.

XV.

Request No. 15:

That the two Coleman wall heaters, model No. 67, which were tested by Henry Landsberg during his deposition on July 26 and 27, 1954, were installed in simulated wall sections in accordance with the installation instructions applicable to each of the heaters.

Defendant denies this request.

XVI.

Request No. 16:

That the defendant's wall heaters, model No. 67, which were tested by Henry Landsberg during his deposition on July 26 and 27, 1954, were connected to the type of gas supply specified by defendant for use in such heaters.

Defendant denies this request.

XVII.

Request No. 17:

That the rates of heat input to the two defendant's wall heaters, model No. 67, which were tested by Henry Landsberg during his deposition on July 26 and 27, 1954, were within the limits established by defendant for such wall heaters.

Defendant denies this request.

XVIII.

Request No. 18:

That the natural gas burned in defendant's wall heaters which were tested during the deposition of Henry Landsberg taken on July 26 and 27, 1954, had a B.T.U. content of 1100 B.T.U.s per cubic foot.

Defendant denies this request.

Dated: December 17, 1954.

LYON & LYON,

/s/ By FREDERICK W. LYON,
Attorneys for Defendant

Affidavit of Service by mail attached.

PLAINTIFF'S EXHIBIT No. 19

In the United States District Court for the Southern District of California, Central Division

[Title of Cause No. 15,886-WM.]

STIPULATION AND ORDER

Defendant's objections to Interrogatories Nos. 5 and 6 heretofore propounded by plaintiff to defendant, having come on for hearing, and pursuant to the following stipulation,

It Is Hereby Ordered and Decreed that defendant need not answer Interrogatories Nos. 5 and 6, and that defendant need not serve and file answers to Interrogatories Nos. 1 and 4 until January 11, 1955.

Dated: This 11th day of January, 1955.

/s/ WM. C. MATHES,

United States District Judge

STIPULATION

It is hereby stipulated by and between the parties that defendant has had substantial commercial success in the manufacture and sale of its models 64, 67, 68 and 69 wall heaters; it being understood that this is not a stipulation that defendant's models 64, 67, 68 and 69 are in any way an infringement of the letters patent in suit.

It is further stipulated between counsel that defendant will supply and has supplied plaintiff's counsel with a copy of the unexecuted answers of defendant to Interrogatories Nos. 1 to 4 and that

these interrogatories will be answered under oath on January 11, 1955.

Dated at Los Angeles, California, this 11 day of January, 1955.

LYON & LYON,

/s/ By FREDERICK W. LYON,

Attorneys for Defendant

/s/ JAMES B. CHRISTIE,

Attorney for Plaintiff

PLAINTIFF'S EXHIBIT No. 30

Coleman Furnace No. 67 Equipped With Either
3 ft. or 4 ft. Secondary Heat Exchanger (Eco-
nomizer)

Comparison of Cross Sectional Areas of Upper
and Lower Radiators

The volume of the lower radiator was measured by plugging its flue tube with wax and filling the rest of the radiator with water. The depth of the water required to fill the radiator being 36 inches. It took 23.2 lbs. of water to fill the radiator. This amounts to 2.78 gallons or 642 cubic inches. The cross sectional area of the lower radiator is therefore 642 divided by 36 or 17.83 square inches.

The cross sectional area of the upper Coleman radiator is uniform and was computed to be 9.28 square inches.

The cross sectional area of the lower radiator divided by the cross sectional area of the upper radiator is 17.8

$$\frac{\text{---}}{9.28} \text{ or } 1.92$$

PLAINTIFF'S EXH. 34

PAGE #

SUBJECT 195 TEST NO. _____ DATE 12/24/58 ENGINEER Biggers

PRODUCT _____
 EFFECT OF TEST Avg 5 element cross sectional Area - Holly 35 NS
and Coleman 35,000 Btu input (old style)

TAIL CHANGES OR CONDITIONS Volume measured exclusive of five tubes.
Five tubes plugged & filled with wax. Units weighed
before and after filling with water.

PROCEDURE-CONDITIONS-SKETCH
Note: weights given below include wt of stand
necessary to hold element in up right position.

Holly 35 NS.

1- filled with water --- 55.1 lbs

wt- empty --- 22.4

$$\text{Volume} = 1728 \times \frac{32.7}{62.4} = \frac{32.7 \text{ lbs} - 11.20}{62.4} = \underline{905 \text{ in}^3} = \underline{3.96 \text{ gallon}}$$

Let A = avg cross sectional area.

$$V = 905 \text{ in}^3 = A h$$

$$A = \frac{905}{34.75} = \underline{26.04 \text{ in}^2}$$

Coleman 35,000 Btu Input

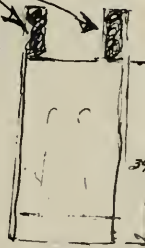
wt- filled with H₂O = 44.6

wt- empty - 21.4

$$\text{Volume} = 1728 \times \frac{23.2}{62.4} = \frac{23.2 \text{ lbs} - 11.20}{62.4} = \underline{642 \text{ in}^3} = \underline{2.78 \text{ gallon}}$$

$$= \frac{642}{36} = \underline{17.83 \text{ in}^2}$$

Wax



Wax



PLAINTIFF'S EXH 34-A

1st. Week of Period		STATUS REPORT											Week Ending 12/28/49		
	30F	30R	37F	37D	45F	45D	57D	25WD	25RD	37W	45W	57D	32D/35		
Prod. Week								465	107				19		591
Rec. Week	8	16	10	14	8	13	3	215	38	(11)	4	0	190	0	509
ed Week	7	14	13	14	17	97	-	18	120	33	9	7	193	-	543
ed d/Date	7	14	13	14	17	97	-	18	120	33	9	7	193	-	543
Sched. d/Date	15	20	25	30	40	160	10	40	135	65	50	50	200		860
uction d/Date								465	107				19		591
Sched. d/Date								355	260						615
Orders Date	973	1178	1051	2326	1284	7356	384	3230	8562	3022	1841	3400	5254	68	39,998
Shipped Date	1082	1138	1076	2037	1276	6467	376	2614	6955	2471	1342	3383	2810	112	33,206
Prod. Date	1521		2598		7569		414	1997	7400	2711	1323	3287	2825		31,645
er Sched. Date	1305	1455	1095	1545	2915	5230	455	1550	7750	775	1275	1645	1885		28,880
Orders and	3	68	5	559	0	1618	2	819	1951	597	433	205	2483	1	8,744
Units and	49		12		3	424	93	29	532	212	233	248	60	-	1,935

Paul

PLAINTIFF'S EXH. 34-A (CONT.)

1st Week of Period

Week Ending 12/27/50

	30F	30D	37F	37D	45F	45D	57F	57D	25NS	25ND	35NS	35ND	45ND	55ND	25NS	25ND	45ND	45ND	135FAB	37W	TOTALS
Units Prod. This Week							7	3	31	9						532					582
Orders Rec. This Week	14	0	5	50	62	12	4	13	42	10	43	46	290	4	13	235		0	1	0	374
Cancellations Shipped This Week	(3)	(3)							(11)	(5)	(40)	(8)		(19)		(164)					(251)
Shipped Period/Date				-2m 10	2	14	47	128	44	7	55	32		33	17	92			1		482
Ship. Sched. Period/Date				10	2	14	47	128	44	7	55	32		33	17	92			1		482
Production Period/Date			15	35	20	100	20	130	120	60	120	65		40	20	175					920
Prod. Sched. Period/Date							7	3	31	9						532					582
Total Orders Year/Date	151 152	827	973	960	2672	1272	8066	296	6676	1684	258	3297	1658	661	8043	2421	7794	289	29	(94)	47,782
Total Shipped Year/Date	151 152	738	923	957	2928	1249	7844	278	5833	483	139	1347	735	1	8996	2415	9143	360	27	316	44,712
Total Prod. Year/Date	151 152	1418		4008		9916	252	5970	1203	299	1520	983	1	8778	2383	9549		19			46,499
Master Sched. Year/Date	1280	1265	1155	1935	1650	6415	560	2415			1690	1300		9075	3630	9075					41,445
Bal. Orders On Hand	50	40	30	320	73	1079	16	1659	1204	118	1944	961	661	557	191	910		5	2	0	9,820
Comp. Units On Hand	- 0 -		134		1199	34	185	720	160	174	247	- 0 -	365	221	466		5	13	1		3,924

Paul

PLAINTIFF'S EXH. 34-A (CONT.)

1st Week of Period

Week Ending 12/27/50

	30F	30D	37F	37D	45F	45D	57F	57D	25NS	25ND	35NS	35ND	45ND	55ND	25NS	25ND	45ND	45ND	135 PAU	97W	TOTALS
Units Prod. This Week							7	3	31	9						532					582
Orders Rec. This Week	14	0	5	50	62	12	4	13	42	10	43	46	290	4	13	235	0	1	0		374
Cancellations	(2)	(2)							(11)	(5)	(40)	(8)		(19)		(162)					(251)
Shipped This Week				-2m 10	2	-1m 14	47	128	44	7	55	32		33	-5m 17	92		1			482
Shipped Period/Date				10	2	14	47	128	44	7	55	32		33	17	92		1			482
Ship. Sched. Period/Date			15	35	20	100	20	130	120	60	120	65		40	20	175					920
Production Period/Date							7	3	31	9						532					582
Prod. Sched. Period/Date																500					500
Total Orders Year/Date	151 827	152 973		960	2672	1272	8066	296	6676	1684	258	3297	1658	661	8043	2421	7794	289	29	(94)	47,782
Total Shipped Year/Date	151 738	152 923		957	2928	1249	7844	278	5833	483	139	1347	735	1	8996	2415	9143	360	27	316	-8m 44,712
Total Prod. Year/Date	151 1618	152 4008				9916	252	5970	1203	299	1520	983	1	8778	2383	9549	19				46,499
Master Sched. Year/Date	1280	1265	1155	1935	1650	6415	560	2415			1690	1300		9075	3630	9075					41,445
Bal. Orders On Hand	50	40	30	320	73	1079	16	1659	1204	118	1944	961	661	557	191	910	5	2	0		9,820
Comp. Units On Hand	-0-		134		1199	34	185	720	160	174	247	-0-	365	221	466	5	13	5m 1			3,924

Paul
2nd Week of Period

PLAINTIFF'S EXH. 34-A (CONT.)

STATUS REPORT

Week Ending 1/2/52

'51

	30F	30D	37F	37D	45F	45D	57F	57D	25NS	25ND	35NS	35ND	45ND	55ND	25MS	25MD	45MD	45M2	135PAU	37W	TOTALS	
Units Prod. This Week									29	14			330								373	
Orders Rec. This Week	CANE NET			(1)					(6)		(40)			(1)							(40)	
		14		15	23	6	103	3	50	289	20	60	57	90	38	2					770	
Shipped This Week		21	2	12	51	6	48	4	47	55	45	44	45	57	20	2					499	
Shipped Period/Date		28	5	19	60	15	76	5	76	106	58	83	90	116	33	6		4			780	
Ship. Sched. Period/Date		40	30	50	50	50	120	10	120	500	120	500	300	270	100						2240	
Production Period/Date									194	14			735								943	
Prod. Sched. Period/Date									220	14			850								1086	
Total Orders Year/Date	151	547	571	631	1264	620	2508	225	3097	14954	2553	10514	5433	5631	1723	17	(128)	(310)	4	1	2	50,022
	152	14		12	20	4	12		21	32	15	48	21	39	4							242
Total Shipped Year/Date	151	991	542	677	1333	688	3139	201	4095	13816	2317	10362	4900	5120	1357	545	29	873	(2)	10	2	50,595
	152	13	1	9	17	25	3		31	19	30	17	25	18	12							220
Total Prod. Year/Date	151	1401		1999		2599		137	4477	14130	2391	10334	4696	5889	2097		130					51,482
	152																					0
Master Sched. Year/Date		15	20	20	30	25	60	10	55	250		60	225	175	135							1130
Bal. Orders On Hand		19	42	17	237	32	423	16	489	2155	221	1856	1298	1195	344	1						8345
Comp. Units On Hand		453		98		913		27	465	930	234	81	23	750	728	6	9	35		2		4747

COMMENTS: Inventory Adjustments as follows: 30FD-1; 37FD-4; 45FD-2; 57FD-5; 57D-1; 25NS-3; 25ND-4; 35NS-4; 35ND-2; 25MS-3; 45MD-8; 55ND-1; 45MD-3.

PLAINTIFF'S EXH. 34-A (CONT.)

STATUS REPORT

WEEK ENDING JANUARY 2, 1953

SECOND WEEK OF PERIOD	30F	30D	37F	37D	45F	45D	57F	57D	60F	60D	25NS	25ND	35NS	35ND	45ND	55ND	25 WS	25 WD	45 WD	135 FA	TOTAL
Units Prod. this Week															608						608
Orders Rec. this Week						(12)		(22)			(51)	(7)	(51)	(62)	(13)	(104)					(316)
Shipped this Week	25	5	3		11	28		(20)	2	13	1454	97	403	111	208	11					2351
Shipped Period/Date			1		12	80		2		10	352	86		1	185	72					801
Shipped Period/Date			4	2	37	170		2	4	65	837	114	3	94	201	134					1667
Ship. Sched. Period/Date	30	20	30	50	40	110			10	100	540	60	600	300	260	190					2340
Production Period/Date											544	199			670						1413
Prod. Sched. Period/Date											554	200			800						1554
Total Order Year/Date	752	660	778	1457	732	3394	67	1646	18	673	21157	2753	15221	8926	8048	4590	48	7	40		70967
Total Shipped Year/Date	677	587	728	1361	654	3158	61	2119		371	15938	2258	12232	7918	7035	3676	4	25	10		58762
Total Prod. Year/Date	801		1999		3329		40	1655		606	15377	2113	12131	7956	6667	2998					55702
Master Sched. Year/Date	15	10	15	25	20	55			5	50	270	30	300	150	130	95					1170
Al. Order On Hand	93	80	64	105	96	376	1	26	21	289	7130	629	5199	2138	2026	1327					19620
Comp. Units On Hand	93	82	64	105	96	395	1	26	21	291	7162	629	5199	2138	2026	1328					19656
Comp. Units On Hand	4		27		452		6	31		232	353	168	9	75	491	54	11	34	27	2	1976

PLAINTIFF'S EXH. 34-A (CONT.)

STATUS REPORT

Final
152

SECOND WEEK OF PERIOD

WEEK ENDING JANUARY 2, 1953

	30F	30D	37F	37D	45F	45D	57F	57D	60F	60D	25NS	25ND	35NS	35ND	45ND	55ND	25 WS	25 WD	45 WD	135 FA	TOTAL	
Units Prod. this Week															608						608	
Orders Rec. this Week	52					(12)		(22)			(51)	(7)	(51)	(52)	13	(104)					316	
Shipped this Week	53	25	5	3	11	28		(20)	2	13	1454	97	403	111	208	11					2351	
Shipped this Week				1	12	80		2		10	352	86		1	185	72					801	
Shipped Period/Date				4	2	37	170		2	4	65	837	114	3	94	201	134				1667	
Ship. Sched. Period/Date		30	20	30	50	40	110		10	100	540	60	600	300	260	190					2340	
Production Period/Date											544	199			670						1413	
Prod. Sched. Period/Date											554	200			800						1554	
Total Order Period/Date	52	752	660	778	1457	732	3394	67	1646	18	673	21157	2753	15221	8926	8048	4590	48	7	40	78967	
Order Period/Date	53		2			19				2	12					1					36	
Total Shipped Period/Date	52	677	587	728	1361	654	3158	61	2119		371	15938	2258	12232	7918	7035	3676	4	25	10	58762	
Shipped Period/Date	53					17				3	12	4				2	30				68	
Total Prod. Period/Date	52	801		1999		3929	40	1655		606	15377	2143	12131	7956	6667	2998					55702	
Prod. Period/Date	53															99					99	
Master Sched. Period/Date		15	10	15	25	20	55		5	50	270	30	300	150	130	95					1170	
el. Order On Hand	52	93	80	64	105	96	376	1	26	21	289	7150	629	5199	2138	2026	1327				19620	
On Hand	53	93	82	64	105	96	395	1	26	21	291	7162	629	5199	2138	2026	1328				19656	
Comp. Units On Hand		4		27		452		6	31	232		353	168	9	75	491	54	11	34	27	2	1976

765

PLAINTIFFS EXH. 34-A (CONT.)

2nd Week of Period

STATUS REPORT

Week Ending 12-31-53

	30F	30D	37F	37D	45F	45D	57F	57D	60F	60D	25NS	25ND	35NS	35ND	45ND	55ND	38 FD	50 F D	25 WS	25 WD	45 WD	TOTAL	
Units Prod. This Week																							
CANC. Orders Rec.													115			18		270				403	
NET This Week	2	4	3	3	4	15																	
HOLLY Shipped	3	1	5	3	4	15																	
This Week WAREHOUSE																							
Shipped Period/Date	17	14	7	13	7	22																	
Ship. Sched. Period/Date	30	20	30	40	36	64																	
Production Period/Date																							
Prod. Sched. Period/Date																							
Total Orders Year/Date	466	628	442	1034	408	1770		9	248	3464	12511	2252	15651	9031	8276	4872	23	16	71	57	2	39	61,270
HOLLY Total Shipped	556	669	486	1051	487	1976																	
Year/Date WAREHOUSE																							
Total Prod. Year/Date	1981		2201		2468																		
Master Sched. Year/Date	711	498	773	1335	1059	2620																	
Bal. Orders On Hand	11	26	15	45		216																	
HOLLY Comp. Units	768		700		463		4	3	1660		4034	707	1669	1486	1544	2160	78	883	16	38	9	16,222	
On Hand WAREHOUSE																							

PLAINTIFF'S EXH. 34-A (CONT.)

Issued 1/10/55

MONTHLY MODEL REPORT - ALL ZONES

HOLLY MANUFACTURING COMPANY

Month of December, 1954

THIS MONTH				YEAR TO DATE			
Orders			Shipments	Orders		Shipments	Backlog
Actual	Canc.	Net	Over or (Under) Plan	Model	Net	Actual Over or (Under) Plan	Actual Variance from 1st of Year
38		38	19	30F-32F	411	386	36
104		104	53	30D-32D	464	414	76
66		66	37	37-38F	518	487	56
115		115	79	37-38D	905	875	65
45		45	33	50F	391	372	19
164		164	103	50D	1,265	1,360	135
27		27	14	60F	222	206	18
651		651	191	60D	2,730	2,610	1,520
1210		1210	529	TOTAL STUBBY	6,906	6,710	1,925
913	8	905	1476	250-S - 251-S	20,095	15,535	9,193
337	3	334	289	250-D - 251-D	2,970	2,354	997
1354	2	1352	1519	350-S - 351-S	23,453	19,279	12,402
473	4	469	742	350-D - 351-D	10,801	10,168	2,889
665		665	661	500-D - 451-D	9,662	8,668	4,437
173	37	136	327	570-D - 551-L	7,354	5,402	1,248
3915	54	3861	5014	TOTAL WALL	74,335	61,406	34,166
28		28	48	75-UF			278
4		4	6	105-UF	531	205	48
32		32	54	TOTAL FAU	531	205	326
2		2	2	OBSOLETE MODELS	37	42	2
5159	54	5105	5599	GRAND TOTALS	81,809	65,363	36,419
100		100	126	CE2	783	723	60
131		131	210	CE4	3,987	2,293	1,869
1181	2	1179	1144	CE5	13,702	13,954	1,709
400	1	399	475	CE7	5,292	5,299	830
53		53	53	CE8 & 14A	287	286	-
887		887	657	CE9 & 13	3,874	3,553	445
105		105	103	CE10 & 15A	767	761	9
129		129	153	CE12 & 17	935	899	10
2986	3	2983	2921	TOTAL CONTROLS	29,627	27,768	4,932

Distribution: Stan Fred Don K.
 . Paul John D. Earl
 Bob Jim C. Scotty

PLAINTIFF'S EXHIBIT No. 35

COMPUTATION

HOLLY WALL HEATER ORDERS

UNITS

Model	1950	1951	1952	1953	1954
25WS.....	8,043	171	48	57	....
25WD.....	2,421	(128)	7	2	....
37W.....	(94)	2	....	....	....
45W2.....	289	4	....	....	....
45WD.....	7,794	(310)	40	39	....
Subtotal Old Style Models..	18,453	(261)	95	98	....
25NS.....	1,684	14,956	21,157	12,511	20,095
25ND.....	258	2,553	2,753	2,252	2,970
35NS.....	3,297	10,518	15,221	15,651	23,453
35ND.....	1,658	5,433	8,926	9,031	10,801
45ND.....	661	5,631	8,048	8,276	9,662
55ND.....	....	1,723	4,590	4,872	7,354
Subtotal New Style Models..	7,558	40,814	60,695	52,593	74,335
Grand Totals.....	26,011	40,553	60,790	52,691	74,335

PLAINTIFF'S EXHIBIT No. 36

COMPUTATION

HOLLY WALL HEATER SHIPMENTS

UNITS

Model	1950	1951	1952	1953	1954
25WS.....	8,996	545	4	(2)	....
25WD.....	2,415	29	(25)	....	....
37W.....	316	2	....	....	....
45W2.....	360	(2)	....	....	....
45WD.....	9,143	873	10	24	....
Subtotal Old Style Models..	21,230	1,447	(11)	22	....

Plaintiff's Exhibit No. 36—(Continued)

Model	1950	1951	1952	1953	1954
25NS.....	483	13,816	15,938	14,763	15,535
25ND.....	139	2,317	2,258	2,261	2,354
35NS.....	1,347	10,362	12,232	12,130	19,279
35ND.....	735	4,900	7,918	8,778	10,168
45ND.....	1	5,120	7,035	6,639	8,668
55ND.....	....	1,357	3,676	3,674	5,402
<hr/>					
Subtotal New Style Models..	2,705	37,872	49,057	48,245	61,406
Grand Totals.....	23,935	39,319	49,046	48,267	61,406

PLAINTIFF'S EXHIBIT No. 37

COMPUTATION

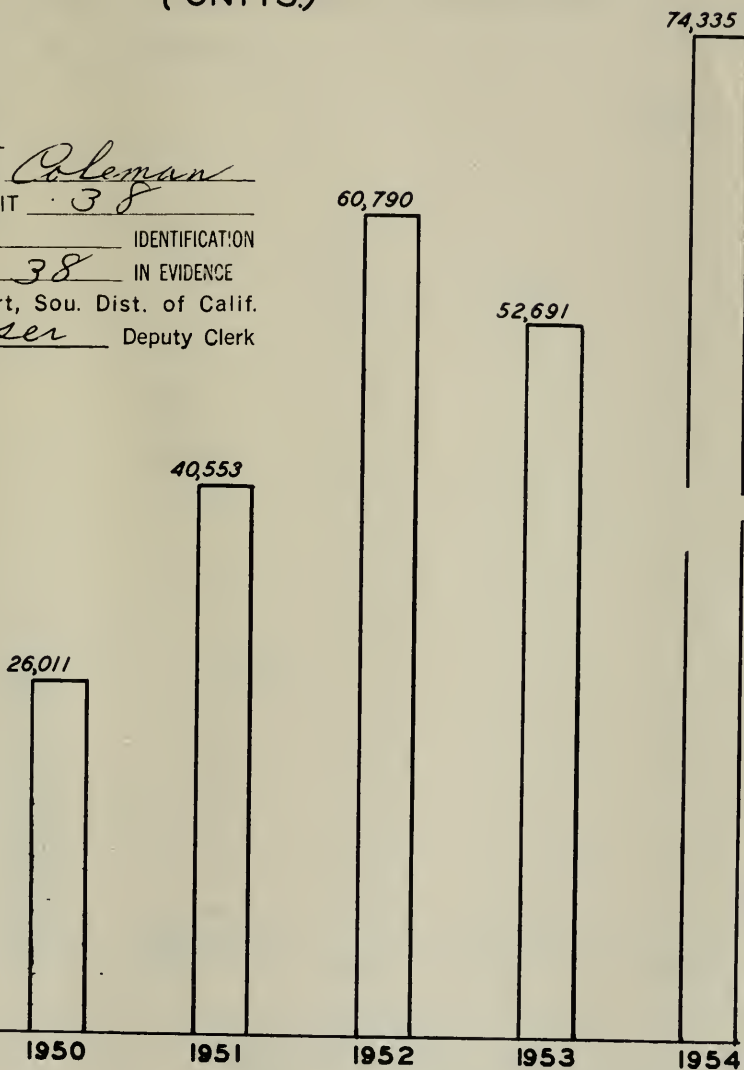
HOLLY WALL HEATER BACKLOG

UNITS

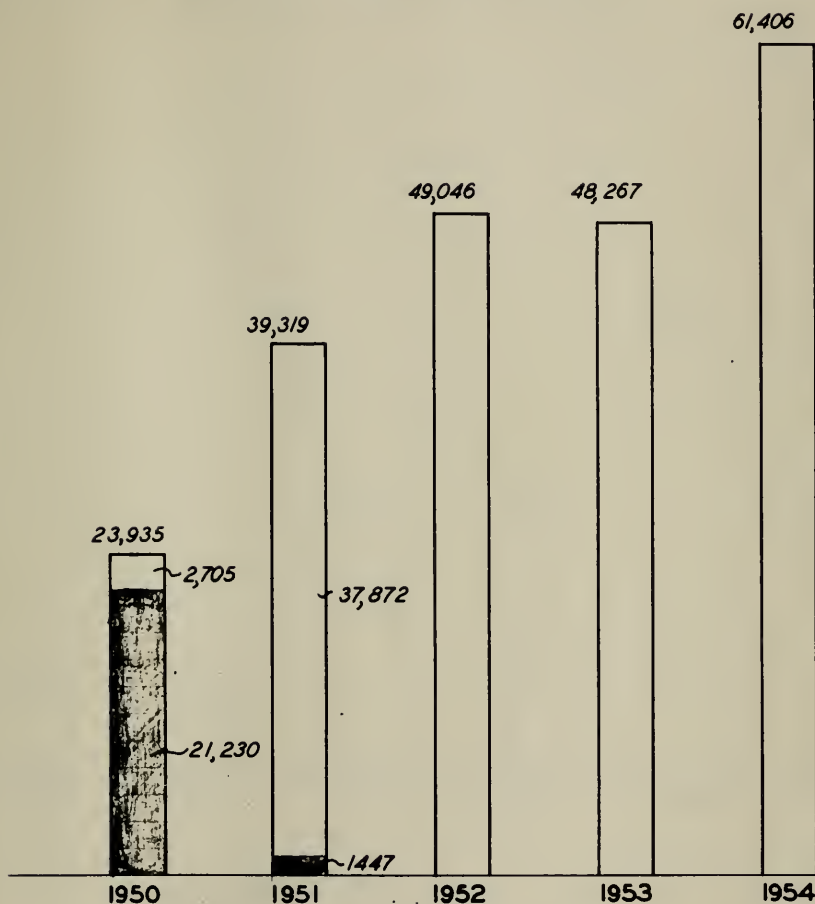
Model	1949	1950	1951	1952	1953	1954
25WS	1,951	557	1	....	6	....
25WD	597	191	....	....	....	....
37W.....	433	....	....	....	....	....
45W2.....	205	5	....	....	....	....
45WD	2,483	910	....	....	1	....
<hr/>						
Subtotal Old Style						
Models	5,669	1,663	1	....	7	....
25NS.....		1,204	2,155	7,150	4,625	9,193
25ND.....		118	221	629	378	997
35NS.....		1,944	1,856	5,199	8,236	12,402
35ND.....		961	1,298	2,138	2,252	2,889
45ND.....		661	1,195	2,026	3,443	4,437
55ND.....		....	344	1,327	2,259	4,248
<hr/>						
Subtotal New Style						
Models		4,888	7,069	18,469	21,193	34,166
Grand Totals.....	5,669	6,551	7,070	18,469	21,200	34,166

HOLLY ORDERS FOR WALL HEATERS (UNITS.)

15886
illy vs. Coleman
EXHIBIT 38
No. 15 IDENTIFICATION
No. 38 IN EVIDENCE
District Court, Sou. Dist. of Calif.
Hooser Deputy Clerk



HOLLY WALL HEATER SHIPMENTS (UNITS.)



Legend

☐ = NEW TYPE

☐ = OLD TYPE

Case No. 15886

Holly vs. Coleman
Plf's EXHIBIT 39

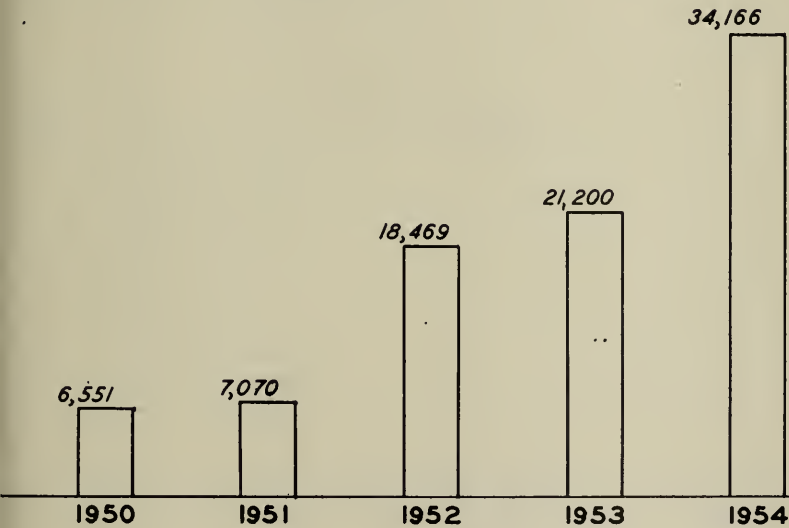
Date 1/20/55 No. 39 IDENTIFICATION

Date 1/20/55 No. 39 IN EVIDENCE

Clerk, U. S. District Court, Sou. Dist. of Calif.

R. D. Hooser Deputy Clerk

HOLLY WALL HEATER UNFILLED ORDER BACKLOG - UNITS AT END OF YEAR



Case No. 15886
Holly vs. Coleman
Plf's EXHIBIT 40
Date 1/20/55 No. 40 IDENTIFICATION
Date 1/20/55 No. 40 IN EVIDENCE
Clerk, U. S. District Court, Sou. Dist. of Calif.
P. D. Hooser Deputy Clerk

PLAINTIFF'S EXHIBIT No. 42

COMPUTATION

TOTAL NATIONAL WALL HEATER SHIPMENTS
UNITS

1950	212,366	Oil & Gas Wall Furnaces
1951	6,595	Oil Wall Furnaces
	198,891	Gas Wall Furnaces
	<hr/>	
	205,486	Total Wall Furnaces
1952	10,561	Oil Wall Furnaces
	250,160	Gas Wall Furnaces
	<hr/>	
	260,721	Total Wall Furnaces
1953	15,285	Oil Wall Furnaces
	314,987	Gas Wall Furnaces
	<hr/>	
	330,272	Total Wall Furnaces
1954	21,526	January Total Wall Furnaces
	20,623	February
	21,968	March
	23,797	April
	23,307	May
	30,571	June
	28,717	July
	35,308	August
	40,501	September
	45,010	October
	<hr/>	
	291,328	10 Months Total Wall Furnaces
	291,328	10 Months 1954 Actual Wall Furnace Shipments
	58,266	2 Months at Average 1954 Level
	<hr/>	
	349,594	Estimated 1954 Total
	Use 350,000	

Note: This is highest of three methods of computation: (a) 10 months actual for 1954 plus November 1953 and December 1953 actuals gives estimated total of 341,884 units. (b) 10 months actual for 1954 plus November 1953 and December 1953 actuals corrected by 7% that 1954 10 months actual exceeds 1953 10 months actual gives estimated total of 345,423 units.

PLAINTIFF'S EXHIBIT No. 43
DATA ILLUSTRATING COMMERCIAL SUCCESS OF NEW
TYPE HOLLY WALL HEATERS

Year	*Total National Wall Heater Shipments Units	Holly Wall Heater Shipments Units	% of National Market	Holly Wall Heater Orders Units	Holly Backlog End of Year Units
1949.....	----	----	----	----	5,669
1950.....	212,366	**23,935	11.3	26,011	6,551
1951.....	205,486	***39,319	19.1	40,553	7,070
1952.....	260,721	49,046	18.8	60,790	18,469
1953.....	330,272	48,267	14.6	52,691	21,200
1954.....	† 350,000	61,406	17.5	74,335	34,166

* Figures from Bureau of Census, U. S. Dept. of Commerce

** 2,705 new type, balance—old type

*** 37,872 new type, balance—old type

† Based on 10 months reports; last 2 months estimated at average 1954 monthly level

DEFENDANT'S EXHIBIT "Q"

In the United States District Court for the Southern District of California, Central Division

[Title of Cause No. 15886-WM.]

* * * * *

DEPOSITION OF WARREN BLAZIER, JR.

of lawful age, having been called as a witness on behalf of the defendant, and being by me first duly examined, cautioned and solemnly sworn to testify the truth, the whole truth and nothing but the truth, deposes and says:

Direct Examination

Q. (By Mr. Dawson): State your name, age, education and occupation, and address.

A. My name is Warren Blazier, Jr. I am 30 years of age. I reside at 1447 North Yale Avenue, Wichita, Kansas. I have an Engineering Degree from the University of Kansas, also a Bachelor of Science in Physics from that same school. I graduated in 1949. I have three years of experience with the Boeing Airplane Company, Wichita, Kansas, as a Research Engineer, and I have been with the University of Wichita Foundation for Industrial Research since May 15, 1952.

Q. What is your present occupation?

A. I am Assistant to the Director of the University of Wichita Foundation for Industrial Re-

* Page numbers appearing at top of page of original Reporter's Transcript of Record.

Defendant's Exhibit "Q"—(Continued)
(Deposition of Warren Blazier, Jr.)

search; also, I am a Research Physicist with that organization.

Mr. Christie: May we have the record show that the heaters were turned off at this point.

Q. (By Mr. Dawson): Were you requested by the Coleman Company to make some tests in connection with Coleman wall heaters? [28]

A. Yes, I was.

Q. Were heaters supplied to you by the Coleman Company? A. Yes.

Q. What were these heaters?

A. We were supplied with two Model 67 single wall heaters; one Model 68 rear outlet heater, and one Model 69 dual wall heater.

Q. Were these heaters installed by you?

A. Yes.

Q. What room are we now in?

A. We are in the North Laboratory of the Wichita Foundation for Industrial Research.

Q. Were these heaters installed in this room?

A. Yes.

Q. Do you have pictures, photographs which show the various stages of installation of these units? A. Yes, I do.

Q. I ask the reporter to mark for identification a book containing photographs, as Defendant's Exhibit A, for identification.

(The instrument referred to was marked Defendant's Exhibit A, for identification.)

Q. Now, referring to this book, state whether or

Defendant's Exhibit "Q"—(Continued)

(Deposition of Warren Blazier, Jr.)

not there is contained in this book photographs showing the various [29] stages of installation.

A. Yes, this book contains a complete set of photographs showing the various stages of installation of these units.

Q. Now, will you take page 1, and describe what appears on this page?

A. The pictures on page one show the two by four stud space construction used as a start of the installation for these four units. The top picture is the front view; the bottom picture is the rear view. With reference to the top picture, from left to right, the first unit is a single wall Model 67 heater; the second unit is also a single wall heater, Model 67.

Q. The third?

A. The third unit is the rear outlet heater, Model 68, and the fourth unit is the dual wall heater, Model 69. In the lower picture these same heaters are shown as a rear view, but their order from left to right is reversed with respect to the picture above.

Q. These pictures show the first stage of installation, where the heaters are secured between studs?

A. That is correct.

Q. What is shown on page 2?

A. Page 2 shows the second construction stage for which lath was attached to the studs to support the wet-wall plaster construction which was to follow. The top picture is the front view, the bottom picture is the rear view. With [30] respect to the

Defendant's Exhibit "Q"—(Continued)

(Deposition of Warren Blazier, Jr.)

top picture the units, from left to right are, (1) Single Wall Heater, Model 67, (2) Single Wall Heater, Model 67, (3) Rear Outlet Heater, Model 68, and (4) Dual Wall Heater, Model 69. The bottom picture is the rear view of the same heaters shown in reverse order with respect to the picture above.

Q. Now, turn to page 3, and state what the photographs there show.

A. Page 3 shows the progress of the test wall at the completion of the plaster work done on it. The top picture shows the wet-plaster type construction in a front view and the bottom picture shows the wet-plaster construction in a rear view, with the additional provision for glass inspection windows on all of the units, with one continuous window for inspection of the operation of one of the single wall heaters, Model 67.

Q. What was the structure of the model to the right of the glass panel model?

A. This was typical wet wall construction.

Q. Now, turn to page 4 and describe what is shown in these photographs.

A. The pictures on page 4 are the finished front views of the test wall. The top picture shows the finished installation of the four units. The bottom picture shows the same finished installation but with the addition of the blower [31] attachment on the single wall heater with the smooth glass-back panel. This blower attachment can fit on any one of these units shown in the picture.

Defendant's Exhibit "Q"—(Continued)

(Deposition of Warren Blazier, Jr.)

Q. Now turn to page 4 and state what these photographs show—page 5, I mean.

A. On page 5, the picture at the top shows the finished rear view of the test wall. It shows the installation of the glass inspection panels and also the metalbestos flues which were placed at the stack outlet of the heaters. The picture at the bottom of the page shows the experimental test setup for evaluating the total economizer air flow by the carbon dioxide dilution technique. At the left of this picture the instrument is a wet test meter used to measure accurately the quantity of carbon dioxide drawn in to the economizer. The apparatus at the right—

Mr. Christie: That is objected to as stating a conclusion with respect to accuracy.

A. (Continuing): The apparatus at the right is a laboratory-type-orsat analyzer. This apparatus was used to measure the amount of carbon dioxide in a sample of gas, by this I mean an air-carbondioxide mixture drawn from the economizer.

Q. Are you familiar with the operation of both of these test devices.

A. I am familiar with the application of the technique. The orsat analyzer should be handled by an experienced chemist, [32] and when these tests were conducted an experienced chemist did the analysis.

Mr. Christie: Objected to as unresponsive to the question.

Defendant's Exhibit "Q"—(Continued)
(Deposition of Warren Blazier, Jr.)

Q. Who did the analysis?

A. Dr. Luther Lyon.

Q. Now, will you turn to page 6, and state what this shows?

A. The picture on page 6 shows two things. First, it shows an air-stop flange which is provided at the top of the lower box to stop air flow which has a tendency to move up between the stud spaces of the lower box.

Mr. Christie: That is objected to again as unresponsive and a statement of a conclusion. I would ask the witness to confine his remarks, unless he is to be qualified as an expert, Mr. Counselor. I think he should confine himself to facts. He continually injects conclusions and hypothesis into his testimony.

Q. Now, will you turn to page 7 and state what is shown on that page?

A. Page 7 shows the air flow characteristics of the single wall heater, Model 67, which was installed with a wet plaster back wall.

Mr. Christie: Objected to. Under the best evidence rule, the photograph speaks for itself. [33]

Q. What operation is being made there in the photograph?

A. The picture on the left shows the insertion of smoke at the economizer inlet; shows the smoke being drawn in at the economizer inlet, and at the top you may see the smoke emerging from the economizer outlet.

Defendant's Exhibit "Q"—(Continued)

(Deposition of Warren Blazier, Jr.)

Q. And the photograph on the right?

A. This shows smoke being allowed to be drawn into the heater from the base and it shows that the discharge of this smoke is from the main grille at the top of the lower box.

Q. Now, on page 8, what is shown there?

A. Page 8 demonstrates the use of the blower attachment with the Model 67, single wall heater. The picture on the left shows smoke being drawn into one of the blower inlets and being discharged at the blower outlet. The picture on the right demonstrates that reverse flow occurs in the economizer when blower operation is added. The smoke is being drawn in the economizer grille and is being discharged at the blower outlet.

Q. Now turn to page 9 and state what is shown in these photographs.

A. The pictures on page 9 are similar to those seen before except that in this case these tests were conducted on a Model 67, single wall heater, having a smooth glass back panel. The picture on the left shows smoke being drawn into the heater at the base and being discharged from the, [34] from the main outlet grille of the lower box. The picture on the right shows smoke being drawn into the economizer inlet provided on the front of the heater and being discharged at the economizer outlet.

Q. Now, turn to page 10, and state what the photographs there show.

A. The photographs on page 10 demonstrate

Defendant's Exhibit "Q"—(Continued)
(Deposition of Warren Blazier, Jr.)

again the addition of a blower unit to the single wall heater—this is the single wall heater with the smooth glass back wall. The picture on the left shows smoke being drawn into one of the blower inlets and being discharged at the blower outlet. The picture on the right demonstrates the reverse flow in the economizer when blower operation is added. It shows smoke being drawn into the economizer grille and being discharged at the blower outlet.

Q. Now, turn to page 11 and state what the photographs there show.

A. The photographs on page 11 show the additional features of the Model 68, rear outlet heater. The rear outlet heater has a grille on the back which may be seen in the picture on the left. The grille is separated by a divider plate which is also visible. At the top an area above this divider plate serves as an economizer inlet, and this photograph shows smoke being drawn into the economizer inlet from the grille at the back of the rear outlet heater. [35] The picture on the right shows this smoke being discharged from the economizer grille on the front of the installation.

Mr. Dawson: I believe this would be a good time to stop for lunch.

(Whereupon, and at 12:05 p.m., January 5, 1954, the taking of this deposition was recessed, and at 1:17 p.m., the same day, the taking of the deposition was resumed, with all parties

Defendant's Exhibit "Q"—(Continued)

(Deposition of Warren Blazier, Jr.)

present as before, the witness Warren Blazier, Jr., being further questioned, as follows:)

Q. (By Mr. Dawson): Will you next take up page—did you finish 11? A. I think we did.

Q. Will you next turn to page 12, and state what the photographs on this sheet show?

A. The photographs on page 12 show the air flow characteristics of the rear outlet heater when smoke is inserted at the air inlet at the base of the heater and demonstrates the discharge of the smoke from the main outlet of the lower box on the front grille and also the rear outlet connection to the lower box on the rear wall. This shows again that the area below the divider plate on the rear outlet grille is a discharge grille.

Q. When you returned from lunch just a few minutes ago, did you start the fires in the heaters 67 with the plaster [36] backing and the glass backing? A. Yes, I did.

Q. Now, will you turn to page 13 and describe what is shown in the photographs on this page?

A. The pictures on page 13 demonstrate the air flow characteristics of the Model 69 dual wall heater. In the picture on the left, smoke is being drawn in through the inlet grilles at the base of the heater on either side of the test wall, and smoke is being discharged from the main outlets for the lower box on either side. The picture on the right shows the smoke discharge flow from the economizer when smoke is allowed to be drawn in through both of the

Defendant's Exhibit "Q"—(Continued)
(Deposition of Warren Blazier, Jr.)

economizer inlet grilles at the top of the heater casing on either side of the test wall.

Q. What means is shown in these photographs for supplying the test smoke?

A. The test smoke for the photograph of the dual wall heater was produced by using titanium tetrachloride. There were two wands made of wire and string, the string end of the wand was inserted in titanium tetrachloride, the smoke is produced by hydrolysis, where it produces—where the products of hydrolysis are hydrochloric acid and titanium dioxide, which is a very dense, white smoke.

Q. Did you use some other means in making some of the tests shown in the photographs for producing smoke? [37]

A. Yes. In other sets of photographs we used a smoke generator which was constructed as a cylinder which was filled with a mixture of oil and rags, was set afire and a stream of air kept flowing through the generator to produce the dense smoke from this type of generator. We used this type of generator for most of our photographic technique since the smoke that it produced made it much simpler to photograph the effect. We prefer to use the titanium tetrachloride smoke generator for most of our observation tests because the smoke vapor from this generator is not nearly as dangerous as the carbon monoxide concentration in the smoke from the other generator.

Q. Now I am going to ask you to make some

Defendant's Exhibit "Q"—(Continued)

(Deposition of Warren Blazier, Jr.)

tests on the Models 67, the one model being the one having a plaster backing and the other having a glass backing. But before making these tests, tell me what is the B.T.U. input for these models?

A. The American Gas Association's specification for these heaters, these two single wall heaters, is 35,000 B.T.U. per hour input. We are putting in 35,000 B.T.U. per hour to each of these heaters. We have a calorimeter technique which allows us to determine the heating value of the natural gas in our laboratory and we are using an American Meter Company wet-test meter to monitor the volume of flow of this natural gas to these heaters. The volume rate of [38] flow is adjusted to give the 35,000 B.T.U. input to the units, based upon the heating value of our natural gas today.

Q. Will you now check the Model 67 with the plaster back and determine whether there has, whether this is sufficiently heated to carry through your first test? A. Yes.

Q. Will you take the titanium tetrachloride wand and have this applied to the bottom of the Model 67 with the plaster back which you have just now referred to. Now, will you state what you observe under these conditions?

A. I observe that smoke from the titanium tetrachloride generator is being drawn in the lower inlet of the heater, near the floor. I observe that smoke is being discharged from the outlet grille provided for the lower box. I also observe that recirculation is

Defendant's Exhibit "Q"—(Continued)

(Deposition of Warren Blazier, Jr.)

occurring where smoke that is coming out of the main outlet grille for the lower box is being drawn into the inlet grille for the economizer which is located immediately above. I observe smoke being discharged from the economizer in small quantity.

Q. Now will you examine the rear side of the Unit 67, with plaster backing, and state whether or not you observe smoke coming up the back side of the unit.

A. I do not observe any smoke moving up the back of the unit which comes from flow along the back wall in the lower box. [39] I do see a small amount of smoke which is entering the economizer which I believe is coming from the inlet grille provided on the front.

Mr. Christie: Objected to on the ground of unresponsiveness. Nobody asked the witness to state his beliefs.

Q. State whether or not you observe smoke entering the inlet grille for the economizer.

A. Yes, I do see smoke entering the inlet grille of the economizer on the front.

Q. In the same model that you have been discussing, will you apply the titanium tetrachloride wand to the inlet of the economizer and state what you observe?

A. I observe the smoke is being drawn into the economizer through the economizer inlet grille, and I see a discharge of smoke from the economizer outlet grille.

Defendant's Exhibit "Q"—(Continued)

(Deposition of Warren Blazier, Jr.)

Q. How does the volume of the discharge compare with the intake, as far as you can tell?

A. Well, I find that hard to say. I see or know of no other place the intake volume can go except come out the economizer.

Mr. Christie: I move the answer be stricken as unresponsive.

Q. Now will you look at the opposite side of the unit and state whether you can observe smoke entering the inlet of [40] the economizer from that opposite side.

A. It is very evident that the smoke that is entering the economizer grille from the front is entering the economizer, and looking at it from the back you can see the smoke coming in through this grille and turning and entering the economizer.

Q. Now, will you apply the titanium tetrachloride wand to the bottom of Model 67, which has a glass panel at the rear, and observe and state what you see at the front of the unit?

A. I see smoke being drawn in at the bottom of the heater; I see smoke being discharged from the main outlet of the lower box. I see a small amount of recirculation occurring where some of the smoke that has been discharged from the main outlet grille of the lower box is drawn into the economizer inlet grille directly above.

Mr. Christie: Objected to as stating a conclusion.

A. (Continuing): I see some of this smoke being discharged from the economizer grille.

Defendant's Exhibit "Q"—(Continued)
(Deposition of Warren Blazier, Jr.)

Mr. Christie: That answer is objected to on the same ground.

Q. Now will you observe the rear of the unit with the glass panel and state what you observe?

A. I see that the smoke which comes from the wand placed at [41] the base of the heater on the front takes several paths. The largest part of this smoke is drawn into the inside of the lower box; some of the smoke, I see, circulates around the lower supports for this lower box; some more of the smoke is moving up the back wall between the smooth glass panel and the outside casing of the lower box. The flow up this back wall is concentrated in the center of the lower box; the pattern is widest at the bottom, narrowest at the top; the pattern I would describe as a rapidly converging pattern. At the junction of the economizer and the lower box I see that the smoke takes several paths at this point; one path enters the economizer; a second path that the smoke is taking is one where it spills around the bottom plate, mounting bracket plate, of the economizer, and thence up the back wall of the economizer out to the attic. Still another path that this smoke takes is up between the stud spaces around the economizer; it is allowed to enter this area from below through a series of vent holes provided on the lower mounting bracket of the economizer.

Q. I hand you a sheet entitled "Diagram of Smoke Pattern along glass back wall of Coleman

Defendant's Exhibit "Q"—(Continued)

(Deposition of Warren Blazier, Jr.)

Model 67 Heater", appearing in Defendant's Exhibit A, for identification, and ask you whether or not that diagram or sketch shows the smoke pattern to which you have been referring? [42]

A. Yes, it does. In addition, this diagram also shows what I now observe and that is the smoke is leaving the stud spaces around the economizer through the attic vent at the top of the unit.

Q. State whether or not it is easy to measure the volume of air flowing in such a smoke pattern in the rear of the heater? A. Yes.

Mr. Christie: Objected to as requiring a conclusion, and indefinite in the designation "easy." Let's ask the witness what he did or what he didn't do, and not ask him what's easy.

Q. Go ahead.

A. The technique which we use to evaluate this quantity of flow was as follows: We set up a very dense smoke, using our other smoke generator which provides this blackish smoke so this flow that you see, the pattern of that flow could be observed on the back of this lower box. We photographed that pattern. Then we transferred the pattern from the photograph to a scale and thence to graph paper so that we could determine graphically the average area through which this smoke passes. We took two
along lower box
points ~~in~~ the center section of the ~~economizer~~
where the major flow occurs and used this section, which is thirty inches long, to evaluate the velocity

Defendant's Exhibit "Q"—(Continued)
(Deposition of Warren Blazier, Jr.)

of this pattern. We did this by [43] injecting the smoke in short puffs and timing the transit time of the puff of smoke between our two monitoring points in the test section. We did this many times so that the time which we considered to be the average travel time of the puff of smoke could be considered reliable. The spacing between the back of this heater casing are—excuse me—between the outside of the lower box and the glass wall is approximately three-quarters of an inch—correction, I mean three-eighths of an inch, so since we know the thickness of the pattern and we determine graphically the width of the pattern, we can determine the cross-sectional area of the pattern. The product of the velocity times the cross-sectional area gives us the flow. We determined this experimentally and we found it to be .85 cubic feet per minute at the 35,000 B.T.U. per hour input.

Q. Have you prepared a sketch showing the method used in preparing these calculations?

A. Yes, I have.

Q. I hand you a sheet, appearing at the end of Defendant's Exhibit A, for identification, and ask you if that is the sheet? A. Yes.

Q. Now will you refer to the sheet and describe the steps taken in arriving at those conclusions?[44]

A. On the sheet we have drawn to scale the back wall of the lower box. When we transferred the dimensions to scale from the photograph we took of this pattern up the back, we find that at our test

Defendant's Exhibit "Q"—(Continued)

(Deposition of Warren Blazier, Jr.)

point "B" the width of the pattern is approximately 3.2 inches, and at the bottom of the pattern, the other extreme, our other monitoring point was 5.6 inches. The average width of this pattern we obtained by the average of the two values at the extremes. The velocity measurement, which was based on the 30-inch section between point "A" and point "B", we found that the puffs of smoke took on the average of two seconds to move from point "A" to point "B". The equation shown at the bottom of the graph is the substitution of the data we obtained in the general equation to determine the quantity of flow up the back, and this equation shows the numerical calculation of the 0.85 cubic feet per minute.

Q. Could you have used a more common method for measuring this flow, such as a velometer?

A. Measuring flow of this type is extremely difficult because the character of the flow is random. The use of a velometer in all cases requires some knowledge as to the flow characteristics of the pattern. Secondly, the sensing elements for most commercially available anemometers will not sense a flow as small as the one we are faced with measuring. This technique seemed to me to be the most [45] direct, since the results that we obtained are based upon repetition of this test many times.

Q. Have you determined the total economizer delivery of these units? A. Yes, we have.

Q. How did you determine this?

Defendant's Exhibit "Q"—(Continued)
(Deposition of Warren Blazier, Jr.)

A. We determined this by two techniques. The first was a chemical technique where we inserted a known volume rate of flow of carbon dioxide gas at the economizer inlet grille. We allowed this known rate of flow to be drawn in to the economizer through the economizer inlet grille on the front of the unit. We then drew a sample of the air-carbon-dioxide mixture that we being discharged from the economizer outlet grille. This sample of gas we analyzed with a laboratory type Orsat Analyzer and determined the percentage of CO₂ in the test sample. The dilution of the carbon dioxide in the discharge sample, compared to the quantity of carbon dioxide that was drawn into the economizer at its inlet grille, gives us a direct measurement of the total flow through the economizer.

Q. State whether or not you followed through all of the tests in connection with the making of this delivery?

A. I witnessed all the tests that were conducted by this CO₂ technique.

Q. Was there another method employed as a check? [46]

A. Yes, we employed a second method. In this case we felt we could use an anemometer, since the quality of flow shown up by the CO₂ dilution method showed us that the range which we would be concerned with was within the effective limits of the particular laboratory anemometer we had available.

Defendant's Exhibit "Q"—(Continued)

(Deposition of Warren Blazier, Jr.)

Q. What was the economizer delivery as determined by these methods?

A. Approximately twenty cubic feet per minute.

Q. I will ask the witness to turn off the fires under models 1 and 2, the 67 Models, which he has been referring to, and turn the fire on under Models 68 and 69. What was the total economizer delivery—I am not sure I understand your last answer?

A. Twenty cubic feet per minute.

Q. Now, taking your measurements as to the flow up the back of the economizer in Unit 67 with the glass panel, and comparing that with the total delivery, what percentage of the air fed to the economizer would flow up the back of the lower heater?

A. Based upon the 20 cubic feet per minute total delivery from the economizer, the .85 cubic feet per minute of flow up the back comprises about four per cent of this total flow in the economizer if we are to assume that all of this flow which starts up the back of the unit actually enters the economizer.

Q. From your observation, is that a correct assumption?

A. No, it is not. I have pointed out previously that I see smoke spilling around the economizer plate; I have seen smoke moving up the back wall of the upper box and I have seen some of this smoke moving between the stud spaces of the upper box and I have seen this smoke come out in the attic vent spaces, which means that the quantity

Defendant's Exhibit "Q"—(Continued)
(Deposition of Warren Blazier, Jr.)

of flow which we measured starting up the back wall of the lower box and up to the point of junction of the upper and lower boxes is divided from that point on and only a part of it enters the economizer.

Q. I call your attention to the photograph on Page 6 in Defendant's Exhibit A, for identification, and ask you whether that shows any means for upward flow of air past the outside of the economizer casing?

A. Yes, this photograph shows vent holes which are provided in the lower economizer mounting bracket to provide a space through which any secondary flow may pass through the stud spaces to the attic.

Q. Now, have you checked the conclusions; or, I should say, have you checked the results which you have referred to by any other tests?

A. Yes, we have checked these by two other techniques. The first cross check was an efficiency test on the single [48] wall heater with the smooth glass-back panel. We checked the thermal efficiency of this unit allowing any secondary flow to occur, and then we checked the efficiency after we had stopped off the secondary flow which might have a tendency to occur up the back wall. We were unable to determine any difference in the results of these efficiency tests, which indicated that any flow which might occur, of a secondary nature, was in-

Defendant's Exhibit "Q"—(Continued)

(Deposition of Warren Blazier, Jr.)

significant in considering the efficient operation of the economizer.

Mr. Christie: Objected to as stating a conclusion which the witness is not competent to draw.

Q. Have you anything else to add?

A. Yes. If the efficiency of the economizer depended upon secondary flow, the thermal efficiency technique would have shown up the change in efficiency when we stopped off any path for secondary flow to occur.

Mr. Christie: Objected to further on the ground that this is an answer to a hypothesis which has not been established by any foundation in the testimony.

A. (Continuing): We further checked our results by measuring the economizer discharge temperatures on the two single wall Model 67 installations. The first unit had a rough plaster back wall and we had not observed any secondary [49] flow occurring in this installation along the path up the back of the space between the outside of the lower box and the back rough plaster wall. The second unit has the smooth back, smooth glass wall and we have observed that some secondary flow does exist up the back wall of this unit. We ran tests to monitor the discharge temperatures of the economizers on both units when they were both operating under the same conditions. We found no difference in the discharge temperatures in these two units. If the secondary flow in the unit having

Defendant's Exhibit "Q"—(Continued)
(Deposition of Warren Blazier, Jr.)

the smooth glass wall had been significant we would have detected a temperature difference in the result of the tests on the two units.

Mr. Christie: Same objection.

Q. Now, in making these various tests and calculations, did you use certain equipment which is now here and available? A. Yes.

Q. Are you prepared to repeat these in the presence of plaintiff's representatives, if they wish?

A. Yes, I would be glad to repeat them.

Q. Now, at the front of Defendant's Exhibit A, for identification, are three pages which bear the caption "Summary of Test Results." Who prepared these three sheets?

A. I prepared these sheets.

Q. What do they set out?

A. They describe the results of four tests which we conducted [50] to study the flow characteristics of the economizer on a single wall unit having a glass back wall.

Q. State whether or not you adopted the statements of these three pages as your testimony in this case? A. Yes, sir, I do.

Q. Are the units 68 and 69 now heated to a point where tests may be made upon them?

A. Yes.

Q. I will ask you to have the wand with the titanium tetrachloride applied to the inlet of the lower heater and then state what you observe.

A. I observe the smoke is being drawn in

Defendant's Exhibit "Q"—(Continued)

(Deposition of Warren Blazier, Jr.)

through the opening near the floor at the rear outlet heater. I see smoke being discharged from the main outlet grille of the lower box on the front of the unit. I see smoke being discharged from the outlet grille to the lower box on the rear of the unit. I see recirculation taking place where smoke from the main outlet grille of the lower box is being drawn into the economizer intake grille directly above on the front of the unit. I also see recirculation taking place at the rear outlet where smoke from the discharge of the lower box to the rear outlet is being drawn back into the economizer outlet—correction, to the economizer inlet provided directly above this outlet grille on the rear of the unit. I see smoke coming out of the economizer and I [51] see the recirculation is still taking place.

Q. Does it make any difference in these tests where you place the smoke-forming unit, as far as you can see?

A. We have found in using the titanium tetrachloride we can place it at any point along the bottom of the unit and achieve the same result. In the case of the other smoke generator, where smoke is ejected at a high velocity, we find it necessary to direct the smoke in a right angle so the smoke would be drawn into the unit to remove any effect of injection velocity in the test. But in the case of the generator we are using at the moment, its position is not critical at the base of the unit.

Q. Would you place it along side the unit, along

Defendant's Exhibit "Q"—(Continued)
(Deposition of Warren Blazier, Jr.)

side the entrance to the unit, to see whether that makes any difference, and then observe the results.

A. I have placed it along side the entrance and raised it to a point about three inches off the floor, and I see no change in the effects that I have just described. Smoke is still leaving the main outlet grille of the lower box on the front and also the outlet grille provided for the lower box provided on the rear. Recirculation is still occurring where smoke from the main discharge stream from the lower box is being sucked in the economizer through the economizer inlets provided on the front of the unit, as well as the economizer inlet provided on the back of [52] the unit.

Q. Now, will you place the wand at the top of the first unit, over the intake for the economizer, and state what you observe.

A. I observe that smoke is being sucked in to the economizer through the economizer inlet grille, and I see smoke enters this grille and I see it being discharged at the economizer outlet.

Q. Is the discharge a substantial volume of smoke?

A. The discharge is much more dense in appearance than the discharge I was referring to when we were describing the recirculation.

Q. Now, will you place the wand at the bottom of Model 69, the dual wall heater, and state what you observe.

A. I observe smoke being drawn in through one

Defendant's Exhibit "Q"—(Continued)

(Deposition of Warren Blazier, Jr.)

of the main inlets at the base of the dual wall unit. I see smoke being discharged from the outlet grilles of the lower box on both sides of the test wall. I see recirculation occurring where the discharged smoke from the stream from the lower box is being drawn into the economizer through the economizer intake grille at the top of the unit on both sides of the wall. I see a small amount of smoke leaving the economizer grille.

Q. Will you now apply the wand to the intake to the economizer above the lower heater and state what you observe. [53]

A. I see smoke being drawn in through one of the two economizer inlet grills provided on this dual wall unit. I see that smoke being discharged at the economizer outlet of the unit.

Q. Now I want to call your attention again to Defendant's Exhibit A, for identification, and more particularly to page 7. State whether or not the photographs on page 7 indicate what you have observed today in connection with the operation with Number 67 Heater, having a rough plaster background.

A. Yes, they do represent what I have just observed.

Q. I think I will ask you to cut off the heaters 68 and 69 and turn on the two 67 heaters. Now, I call your attention to the photographs on page 9 and ask you whether the photographs here accurately show what you have observed in tests today

Defendant's Exhibit "Q"—(Continued)
(Deposition of Warren Blazier, Jr.)

on the single wall heater No. 67 with this glass back wall? A. Yes.

Q. Now I call your attention to page 11, and ask you whether the tests performed here today, as you have observed them, on the rear outlet heater, Model 68, show the results set out in these photographs? A. Yes, they do.

Q. Referring to page 12 of the book marked Defendant's Exhibit A, for identification, state whether these photographs [54] show accurately the results of tests which you have made today on Model 68. A. Yes, they do.

Q. Referring to page 13 of this book, state whether the photographs accurately show results which you have observed today in making the tests on this Model 69. A. Yes, they do.

Q. Will you demonstrate the use of the blower on Model 67, having a rough plaster back wall, and state what you observe, applying the wand to the bottom of the unit?

A. The blower is now operating as an attachment to the single wall heater, Model 67, having a rough plaster back wall. With the wand placed at the base of the heater, I see smoke being drawn into the lower box; I see smoke being discharged at the main outlet grille of the lower box and being disturbed in pattern by the air flow from the blower.

Q. Where are you now placing the wand?

A. I am now placing the wand at one of the blower intake grilles. I see smoke being drawn into

Defendant's Exhibit "Q"—(Continued)

(Deposition of Warren Blazier, Jr.)

the blower inlet; I see it being discharged from the blower outlet. I am now holding the wand over the grille which, in the unit without a blower, is an economizer outlet grille. With the blower attachment this outlet grille has now become an economizer inlet grille and smoke is being drawn into the economizer through this grille, and I see it being discharged by the [55] blower at its outlet.

Q. In the first test that you made with the wand at the bottom of the heater, was there any discharge from the economizer?

A. No. We can observe that again—I have observed many times that there is not, and I will do it again. I see no smoke being discharged from the economizer grille.

Q. Now will you place the blower upon the Model 67, with glass panel, and make the observations which you have made with respect to the last Model 67?

A. Yes.

Q. You have now placed the wand under Model 67 with glass panel, equipped with a blower. Now state what results you observe.

A. I see smoke being drawn in through the air intake at the bottom of the heater. I see smoke being discharged at the main outlet grille of the lower box and being blown about by the output of the blower directly above. I see no smoke coming out of the economizer.

Q. Will you now place the wand over the inlet to the fan and state what results you observe?

Defendant's Exhibit "Q"—(Continued)
(Deposition of Warren Blazier, Jr.)

A. I see smoke being drawn into one of the inlets through this blower attachment and I see it being discharged at the blower outlet directly above the outlet grille for the lower box.

Q. Now place the wand over the top opening of the economizer, [56] and state what you observe.

A. I see smoke being drawn into the economizer grille, demonstrating the reverse flow through the economizer when blower operation is added to this single wall unit. The grille, which without the blower is an economizer outlet grille, becomes an economizer inlet grille when the blower is added. I see smoke being sucked in the economizer through this economizer grille. I see it being discharged by the blower outlet.

Q. I call your attention to photographs on page 8 of Defendant's Exhibit A, for identification, and ask you to state whether or not these photographs accurately show the results to which you have just testified? A. Yes, they do.

Q. I call your attention to page 10 of this book relating to the 67 heater with the smooth glass back wall, equipped with the blower, and ask you whether the photographs here accurately represent what you have testified to, your observations here today? A. Yes, they do.

Mr. Dawson: The book which the witness has identified as Exhibit A is offered in evidence as Defendant's Exhibit A.

Mr. Christie: We object on the ground that no

Defendant's Exhibit "Q"—(Continued)

(Deposition of Warren Blazier, Jr.)

proper foundation, no proper identification of [57] photographs has been made.

Mr. Dawson: Right here I wonder if we might stipulate as to the signature of the witness?

Mr. Christie: It is stipulated that the witness may sign the deposition before a Notary.

We would like to have a short recess—I don't know how long it would take in order to familiarize ourselves with this equipment and possibly make some tests on it before we go ahead with the cross examination. This equipment we saw for the first time this morning and we would like to look at it and possibly do some testing work with Mr. Hollingsworth here before we proceed with the examination.

Mr. Dawson: I wonder if we might also cover that part of the testimony taken while the witness was not under oath and omit that part from the record.

Mr. Christie: I would prefer to have it in the record. I want to compare what he testified to the first time with his testimony the second time.

Mr. Dawson: All right. You may cross examine.

Mr. Christie: At this time we would like to have a recess long enough to make this inspection of the apparatus and possibly some tests Mr. [58] Hollingsworth might want to make.

Mr. Dawson: When you make any tests we would like you to make them inter-parties, just as we have made them here.

Defendant's Exhibit "Q"—(Continued)
(Deposition of Warren Blazier, Jr.)

Mr. Christie: You are not naive enough to tell me that you haven't tested this equipment before today?

Mr. Dawson: That's correct, but if you want to make tests I think they should be in the record.

Mr. Christie: I don't see why they should be; I don't know any rule that requires our tests to be made inter-parties any more than a rule which requires you to make all your tests inter-parties. So I enter a very pronounced objection to that proposal.

Mr. Dawson: Let the record show that counsel refuses to have representatives of defendant present in making tests on this apparatus.

(Whereupon, and at 3:00 p.m., January 5, 1954, the taking of this deposition was recessed, and at 4:20 p.m., the same day, all parties being present as before, the witness, Warren Blazier, Jr., was further interrogated, as follows:) [59]

Cross Examination

Q. (By Mr. Christie): Mr. Blazier, you testified you worked for Boeing Aircraft for three years. What did you do there?

A. I worked as a Research Engineer with Boeing Airplane Company. My work consisted of analyzing test procedures used and evaluating various sub-products as means of quality control, of attending conferences with sub-contractors who were

Defendant's Exhibit "Q"—(Continued)

(Deposition of Warren Blazier, Jr.)

doing these tests on products which we were buying.

Q. What kind of products?

A. They varied; the majority of them were electronic in character. The scope was from radar equipment through gasoline tank-full-capacity indicators, airplane weighing devices, temperature control, pressurizing regulators and controls, the general field of electronic equipment purchased by Boeing for installation in the B-47. In addition to that, I maintained close contact with the research laboratories at Wright Field, a division of the Airforce Development Command, where we kept close contact with new developments at Wright Field for inclusion in subsequent models of the B-47 work. In this work I became familiar with a broad variety of test equipment and test techniques as well as application and selection of techniques for tests. [60]

Q. Did you ever work on any heaters while you were at Boeing?

A. Not directly as heaters, no.

Q. Now, what has been your experience here at the institute?

A. With the exception of the first two months that I have been with the University of Wichita Foundation for Industrial Research, I have been engaged almost entirely full time on projects sponsored by the Coleman Company. These projects have all, up to this point, been in the field of heating and distribution of hot air.

Defendant's Exhibit "Q"—(Continued)
(Deposition of Warren Blazier, Jr.)

Q. You have had, then, approximately 16 months' experience in hot air heaters?

A. I have had 16 months' experimental experience with this organization, yes.

Q. And was all that 16 months devoted to work on Coleman heating equipment of one kind or another? A. That is correct.

Q. Does Coleman pay you for this work?

A. No directly, no. Coleman places a project with our organization, we organize and handle the project and bill Coleman as an organization for the cost of the project.

Q. What were your instructions on this job that you have testified about today?

A. We were asked by the Coleman Company to construct a test wall which would meet the requirements for ordinary installation procedures in various types of wall heaters [61] to be built. We were asked to study the flow characteristics in these heaters with particular attention to the operation of their economizer to determine what factors provided for efficient operation of the economizer.

Q. Is this the only wall you built?

A. Yes, this is the only wall that we have built.

Q. Have you ever seen a plaster wall constructed before?

A. Yes, I have. We wrote and got the Los Angeles City Building Code as an aid in seeing what that part of the country did in that type of construction. We called in licensed plasterers to do

Defendant's Exhibit "Q"—(Continued)

(Deposition of Warren Blazier, Jr.)

this work. We did not do the plastering or wire lath application ourselves. We built the two by four studs and called in people who do this as a livelihood to complete the final construction of the units.

Q. Did you observe the plastering?

A. Yes.

Q. And you had previously observed plastering procedures?

A. I have seen my own house plastered.

Q. Did you notice any difference in the way this was plastered, and your own house?

A. The difference I noticed was they used the wire lath construction. The plastering that I have seen myself has been plaster over wood lath.

Q. So this is the only metal lath construction that you ever saw plastered? [62]

A. Yes, it is.

Q. And you have nothing to compare it with, then, in the scope of your own experience?

A. Yes, I do. My associates in this organization were working in close coordination with the people assigned to this project; we had the opinions and experience of other people on our staff who monitored the progress of the project as it went along.

Q. Within your own experience, you have never seen a plaster job done on metal lath until this one was done, isn't that correct.

A. Within my own experience, of actual observation, this is the first I have seen, yes.

Defendant's Exhibit "Q"—(Continued)
(Deposition of Warren Blazier, Jr.)

Q. And so you, yourself, have no basis for comparison as to whether or not this job is standard or otherwise, is that correct?

A. No, I wouldn't agree with that. I feel that I can still rely upon the opinions and advice——

Q. (Interrupting) I am asking you, within your own experience.

A. Well, my experience involves the advice and opinions of the people I work with. Our organization is an integrated organization; we never accept a project by virtue of the merit of one particular person. One of the stipulations, when we accept a project, is that each member of the staff has some sort of responsibility on the project. The [63] coordination of the project is through cooperation of all of the facilities and intellectual abilities and techniques of the whole staff.

Q. Let me ask you—I suppose in the course of your education you read some text books, isn't that true?

A. I have read text books, yes.

Q. Doubtless the man who wrote the text book had some experience, isn't that correct?

A. Either that or he had read other text books.

Q. Would you now say that that experience of a man who told you or whose textbook you read was your own experience? I am asking you to confine this to your own experience.

A. I can't answer your question.

Defendant's Exhibit "Q"—(Continued)

(Deposition of Warren Blazier, Jr.)

Q. Now, who told you how to install these furnaces?

A. We were given the published installation instructions, printed by the Coleman Company, for use of the people in the field in installing their equipment, and we followed these installation instructions.

Q. I hand you a document consisting of ten pages, entitled "How to Install Coleman Gas Wall Heater—Model Nos. 67 & 68", and ask you if that is the document you referred to?

A. I would like to establish it, for there are a series of documents on the same installation procedures.

Q. Well, I am asking the questions. Is this the document you mentioned you followed, or isn't it?

A. It looks similar to the document we used.

Q. Can you produce the document you did follow?

A. Yes, I think we can.

Q. Will you do so?

(Whereupon, counsel for the defendant hands a document to the witness.)

Q. (By Mr. Christie): Counsel has handed you another document consisting of 10 pages, which appears to be the same that I handed you. Is this the document you followed?

A. Yes, sir.

Q. How do you know it was that document you followed when you were unable to tell me this one that I handed you previously?

A. Well, for this reason. I am aware that all

Defendant's Exhibit "Q"—(Continued)
(Deposition of Warren Blazier, Jr.)

installation and operating procedures by any organization is subject to revision; I do not see any revision date on these; I wasn't certain whether the copy that you handed me was of the same revision as the copy which we used to install.

Q. How do you know that the one that has been handed you is that one?

A. Well, this has been handed me as a copy of the one that was given us at the time we installed the units.

Q. Of your own knowledge you do not know whether this is the instruction you followed or not; you are simply relying on the fact that counsel handed it to you, is that correct? [65]

A. Well, I believe this is the document that we used for installation of these heaters.

Q. What is the basis of that belief?

A. The same source for which I just received this document was the source for the first document we used for installing the units.

Q. But you do not recognize the document itself?

A. Certainly I recognize the document. It appears to be the same document we used.

Mr. Christie: I ask that the document which was handed to the witness by defendant's counsel be marked for identification as Plaintiff's Exhibit 1.

(The document was so marked by the reporter.)

Defendant's Exhibit "Q"—(Continued)

(Deposition of Warren Blazier, Jr.) .

Mr. Christie: I ask that the document which I first handed to the witness, which he was unable to identify, be marked Plaintiff's Exhibit 2, for identification.

(The document was so marked by the reporter.)

Q. (By Mr. Christie): Now, I ask you to compare Plaintiff's Exhibit 1 and Plaintiff's Exhibit 2 and tell me if you find any difference in the printed matter of these two exhibits?

A. You want me to read the total printed matter of both exhibits? [66]

Q. If you need to. I want you to tell me whether or not they are the same, and you do anything you find is necessary.

A. Well, there is a simple way to tell—F5465 on this one; they carry the same document number, so I will assume they are the same.

Q. Let's not assume anything. Just tell, just state whether they are the same or not.

A. Yes, they are the same.

Q. But you were unable to tell me when I first asked you whether or not Plaintiff's Exhibit 2 was the set of instructions that you followed, isn't that correct?

A. Plaintiff's Exhibit 2 is the first document you handed me, right?

Q. Yes.

A. Yes, I couldn't tell until I checked the serial numbers at the back of the document to determine

Defendant's Exhibit "Q"—(Continued)

(Deposition of Warren Blazier, Jr.)

if what you had was of a different revision status than what I had.

Q. At that time you didn't have any document before you at all when I first handed you Plaintiff's Exhibit 2?

A. I had no document for comparison.

Q. The document that you did use for comparison purposes was one that was handed you by defendant's counsel, isn't that correct?

A. That is correct. [67]

Q. And you had no independent recollection about either of these two documents, then?

A. To answer whether the document you handed me was identical with the document I used to install these furnaces, I couldn't identify the document unless I had some means for comparing the document that you handed me with the same document number which we used to install these furnaces.

Q. How did you know what that document number was?

A. I know the document which counsel has is similar or the same document as the one we were given to install these heaters. It is the same publication number.

Q. What I am trying to get at, Mr. Glazier, is why you were able to identify the document that counsel for the defendant handed you when you were unable to identify the one I had handed you, that now turns out they are the same documents?

Defendant's Exhibit "Q"—(Continued)

(Deposition of Warren Blazier, Jr.)

A. I can't answer that. I have given you the reasons; I know of no other way to state them.

Mr. Dawson: This line of cross examination is objected to as being repetitive. Counsel called for the production of a document and the document has been produced.

Q. (By Mr. Christie): Is the witness willing to tell that this document, identified as Exhibit No. 1, for identification, is the document he used in preparing and setting [68] up this panel?

A. Yes, this is the document that we were given as an aid in setting this test panel.

Q. I believe you testified that you had tried various positions for the wand in your tests and found that it made no difference?

A. With reference to the position of the wand at the inlet to the heater at the bottom on the front I said that the lateral position of the wand at the outside of the furnace on the front made no difference as far as the character of the flow that we observed in the economizer.

Q. Now I believe you also testified that you took photographs of the smoke pattern at the back of the No. 67 Heater which has the glass running from the top to bottom, is that correct?

A. That is correct.

Q. Can you produce this photograph?

A. Yes.

Q. We would like to see them just a moment.

Mr. Christie: I ask that the photograph which

Defendant's Exhibit "Q"—(Continued)
(Deposition of Warren Blazier, Jr.)

the defendant has just produced be marked as Plaintiff's Exhibit 3 for identification.

(The photograph referred to was so marked by the reporter.)

Q. Mr. Glazier, is this the only photograph that you had, or [69] are there others.

A. By that do you mean is that a print of the only negative that we have?

Q. Correct.

A. Yes, this is the one that we used to determine the shape of our pattern.

Q. Did you take any other pictures of the pattern?

A. We took a multitude of pictures in an attempt to catch, photographically, this pattern. This was the only successful picture.

Q. May we have production of the unsuccessful ones; I would like to see them all.

A. We haven't prints because we inspected the negatives to see if the smoke stream did show up and those negatives were discarded until we did get a negative that did show the stream.

Q. Were those negatives destroyed?

A. I am not sure.

Q. Have you made a diligent search to see whether or not they are available?

A. I haven't made the search because I saw no significance to the negatives. There were problems of not enough exposure time, improper lighting, and various other things.

Defendant's Exhibit "Q"—(Continued)

(Deposition of Warren Blazier, Jr.)

Mr. Christie: Move that the witness' answer be stricken as argumentative.

Q. Do you, or do you not know whether or not these negatives [70] are still in existence?

A. I don't know.

Q. You cannot produce them?

A. I don't know.

Q. How long would it take you to find out?

A. Just a few minutes, I think.

Mr. Christie: May we have a recess while the witness endeavors to produce the pictures.

(Whereupon, a recess of approximately five minutes was taken, after which, all parties being present as before, the cross examination of the witness, Warren Blazier, Jr., continued as follows:)

Q. (By Mr. Christie): Mr. Blazier, you have handed me another photograph, and I ask that it be marked as Plaintiff's Exhibit 4, for identification.

(The photograph referred to is marked Plaintiff's Exhibit 4.)

Q. Now, I ask you whether Plaintiff's Exhibit 3 and 4 are the only photographs that you took of this smoke pattern?

A. Do you mean by this, the only successful pictures?

Q. No, the only pictures. Did you take other pictures, and if so, where are they?

A. We took no other successful pictures. The

Defendant's Exhibit "Q"—(Continued)
(Deposition of Warren Blazier, Jr.)

negatives that were ruined due to improper exposure, reflection from the glass—all of the things involved in determining the [71] photographic technique that would produce the picture that looked the same as what we would observe visibly, of all those negatives these are the only two which we have saved. We took many others which were simply a waste of time.

Q. And what happened to them?

A. They were destroyed.

Q. By a successful picture, what do you mean?

A. This photograph, as I have explained before, was used to show the shape of the secondary flow which, we had observed, moved up the back of the glass wall Model 67 heater. We were trying to achieve a photograph which would outline that shape in such detail to scale its width against the known width of the economizer on a ratio basis. This first one that I handed you was used over the second one which you received. Plaintiff's Exhibit 3 was used in place of Plaintiff's Exhibit 4 because Exhibit 3 was a closer shot which more precisely showed the outline of that smoke pattern.

Q. Now referring to the last page of Defendant's Exhibit A, I ask you whether or not this is a drawing that you made of what you saw in the photograph?

A. This is a drawing that was made from the scale obtained from the photograph, over the 30 inch distance up to the economizer. [72]

Defendant's Exhibit "Q"—(Continued)
(Deposition of Warren Blazier, Jr.)

Q. In other words, the edges of the smoke pattern in the photograph are shown in the drawing, is that correct? A. Would you repeat that?

Q. The edges of the smoke pattern which you identified as, which I identify as upwardly slanting lines in the center of the drawing, connected by the dimension "W", are the same as the outside lines of the smoke pattern as you see in the photograph, Plaintiff's Exhibit 3?

A. The lines shown on the graph are an approximation of the contour of the edge of the smoke pattern in the region that we tested.

Q. What do you mean by an approximation?

A. Well, the edge of your smoke pattern we drew a straight line, which is an approximation of that irregular edge.

Q. So that the slope of the line is, the slope of the lines between the dimension "W" on the drawing and the slope of the lines on the smoke pattern are intended to be the same?

A. They are intended to be similar. We made certain when we drew this graph that we were including all of the area within the boundary of the graph that was filled by smoke in the picture. In any dissimilarity that you may notice, if you do, between what we have drawn on the graph and what you see on the photograph, is of a nature that it would increase the value which we would calculate for flow up the back. It is in the direction which would increase [73] our numerical result.

Defendant's Exhibit "Q"—(Continued)
(Deposition of Warren Blazier, Jr.)

Q. In your calculations which you based upon the graph, on the last page of Defendant's Exhibit A, for identification, any calculations which you made you assumed that the space outside the lines joined by the dimension "W" is dead air space in which no smoke movement occurred?

A. We observed no smoke movement in the space outside of the area that we have shown here, within the region that we had our test section.

Q. Isn't it true that in the calculations you made you assumed that all of the smoke came up through this tapered chimney, if you will, represented by two lines joined by the dimension "W"?

A. That was the only smoke we observed in that region.

Q. That isn't the question I asked you then. Did you not assume in your calculations that all of the gas movement was within this tapered portion which I show marked "X"?

A. Yes, within that section we did not assume; we observed it. It was obvious that within the center of our test section that we were using the only smoke in the cross-section through that area fell between these two lines that we have shown. It was not an assumption; it was an observation.

Q. You used that observed fact, if you will, in your calculations, is that not correct? One of the premises of your [74] calculations of the amount of gas which moved up the back of the heater is that

Defendant's Exhibit "Q"—(Continued)

(Deposition of Warren Blazier, Jr.)

it all moved up through this tapered section "X", isn't that correct?

A. It was not a premise, it was an observed fact that in the test section that we were concerned with all of the smoke existed between the two lines drawn on the graph.

Q. That enters into your equation, does it not?

A. Yes.

Q. How does it enter in?

A. These lines——

Q. Identify them as numbers.

A. The area shown in the center of the graph which you have marked "X" on your copy——

Mr. Christie: I believe he should mark the exhibit, Exhibit A, for identification, if that is all right.

(A drawing in Defendant's Exhibit A, for identification, was marked by the witness.)

Q. You have just marked the drawing. Will you tell me what you have done to it?

A. I have identified the area between the smoke pattern outlines on the graph; I have marked that area between those two lines and bounded by "A" and "B" as Area "X".

Q. Now, will you mark the two outlines of the smoke pattern on the drawing? [75]

A. We will mark line "Y" and line "Z" as the boundary lines for the smoke pattern, and I want to make it clear that the smoke pattern that we are

Defendant's Exhibit "Q"—(Continued)
(Deposition of Warren Blazier, Jr.)

talking about lies within these boundary lines in our test section.

Q. And you observed that the entire gas movement was within the area "X", between the lines "Y" and "Z", is that correct?

A. That is correct.

Q. And that was the basis of the calculation which you made of the amount of gas that traveled up the back of the heater, is that correct?

A. That was part of our calculation, that was part of the technique we used, yes.

Q. Now, did you in your calculation, Mr. Blazier, assume that there was movement up the back of the heater outside the zone "X" but between "Y" and "Z"?

A. It was not necessary to make any assumption of that type since we did not observe any smoke movement outside the test section.

Q. Mr. Blazier, you are an engineer, you are familiar with calculations, I assume. Now, in this calculation, there is—I will phrase it this way: you agree with me, do you not, that in a furnace there is an open space across the back which extends from one two by four to the other two by four, as for example in furnace 67 with a glass panel [76] at the back, is that correct?

A. In the single wall heater with the glass-back wall panel there is a space between the back wall of the lower box and the glass back wall surface.

Q. And does that extend from the point which

Defendant's Exhibit "Q"—(Continued)

(Deposition of Warren Blazier, Jr.)

I show marked "Q" to the point which I shall mark "R" in my drawing and ask you to make similar marks on yours?

A. Would you re-state again what points "Q" and "R" are?

Q. Oh, I am sorry. "Q" is the inside of the heater support, the two by four, as it is shown in your drawing and "R" is a similar support, vertical.

A. There is no support here; here is the edge of the two by four. This is the space.

Q. I am sorry. Will you mark what the open space is on your drawing and mark one side of the open space "Q" and the other side "R"?

A. The open space that I am referring to can't be shown in this view of the drawing and this drawing is not intended to be a true detailed, scaled drawing of all of the brackets and supports of this wall heater. This drawing is simply submitted to get the general outline area that we are discussing and it is not intended to show the construction and installation of the glass panel, it doesn't show the stop-off flanges that are mounted in this space that you want me to identify. [77]

Q. Perhaps I can get at it another way. Will you agree with me, Mr. Blazier, that the area "X" is not the entire open area at the back of the lower box of the heater?

A. Yes, I will agree with that.

Q. And there is additional open space. Now, will you mark in some fashion on the drawing on

Defendant's Exhibit "Q"—(Continued)

(Deposition of Warren Blazier, Jr.)

the last page of Defendant's Exhibit A, for identification, the additional open space at the back of the heater?

A. I can't mark it on this drawing because it is not complete.

Q. You can't even approximate it?

A. I hesitate to approximate it because this is not an engineering drawing; this is merely a sketch.

Q. You can't do it, within the scope of your engineering experience you can't indicate the rest of the open space on the back of this?

A. That is not what I am saying. I am saying that you are asking me to identify the open space, using this drawing as the means of identifying it. I am saying that my engineering experience tells me that I should not mark off areas on a drawing that is not complete, and for that reason I cannot do what you ask.

Q. So you will agree with me that this is not a true representation of the back of the heater?

A. I will not agree with you that it is not a true representation of what we are attempting to show in this particular [78] test.

Q. That is not my question, Mr. Blazier.

Mr. Christie: Mr. Reporter, read the question.

By the reporter:

"Q. So you will agree with me that this is not a true representation of the back of the heater?"

A. This was not intended to be a true representation of the back of the heater. Its only intent

Defendant's Exhibit "Q"—(Continued)

(Deposition of Warren Blazier, Jr.)

was to outline the area which is pertinent to the subject of the test for which this drawing is an expedient.

Q. Let's try to get at it another way, then. I will make a point "M" on my drawing and ask you to make a similar point on yours.

A. That point there?

Q. Yes. Now, is that point "M" in the open space at the back of the heater?

A. Yes, it is.

Q. But in your computations you assumed that there was no movement of air passed that point, isn't that correct?

A. I stated, and I state again, it was not an assumption. I would like to explain why that is not an assumption. The smoke that was used to set up this pattern was generated at the front of the unit at the main air intake for the single wall unit. The smoke which we saw up the back showed the movement of the air flow in the back wall area [79] of this system which occurred under natural causes. If there had been air movement in these other spaces which you are referring to, including the point "M", the air flow which we have been studying with respect to the system operation would have shown a smoke distribution in that area.

Q. Well, now, I am going to ask Mr. Hollingsworth if he will apply smoke to the first of the No. 67 furnaces, which is the one without the entire glass panel, and ask you to observe the point at

Defendant's Exhibit "Q"—(Continued)
(Deposition of Warren Blazier, Jr.)

which Mr. Hollingsworth applies the wand. Now I will ask you if you have observed that point?

A. I observed that you are placing the wand at the point where it is out of the main intake flow of this unit.

Q. It is within the heater at the lower right hand corner, is that correct?

A. It has been placed in the heater at a point beyond the air intake for the unit and has been placed in the lower right hand corner.

Q. Now will you please observe the rear, and will you tell me if you see any smoke passing up in the back of the glass panel?

A. With the wand placed at a point that is out of the main intake for the heater and placed in an area within the stud spaces which is not subject to the flow characteristics and conditions of the unit, I see that you have produced [80] some smoke, yes.

Q. Now, where is that smoke going?

A. Some of it is going in the economizer; I can see some of it spilling over the economizer plates and going on up through, along the economizer wall, to the attic.

Q. But some of it you can see going into the economizer, can you not?

Q. With the wand placed where you have placed it, outside of the——

Q. (Interrupting): Let's not argue about it. Can you see it or can't you?

Defendant's Exhibit "Q"—(Continued)

(Deposition of Warren Blazier, Jr.)

A. With the placing of the wand where you have, I can see some smoke.

Q. Step around to the front and repeat your observations of this morning and see if you can see any smoke coming out of the top grille of the economizer.

A. I see more flow coming out of the main outlet of the lower box than I see coming out of the economizer.

Q. You see smoke coming out of the economizer, do you not?

A. With your wand placed where it is I would expect to see smoke coming out.

Mr. Christie: Would you give us a little more smoke in the same position, Mr. Hollingsworth?

Q. Now, will you again observe the heater and tell me what you see. [81]

A. I see a lot of smoke coming out of the main outlet grille of the lower box and I see very little smoke coming out of the economizer by comparison.

Q. But you do see smoke coming out of the economizer?

A. A small amount with the wand placed where it is.

Q. Do you see any smoke coming out of the top of the grille on the lower case?

A. Do you mean the economizer inlet grille?

Q. I don't know how you identified it; this grille in which you have these small wire places.

Defendant's Exhibit "Q"—(Continued)
(Deposition of Warren Blazier, Jr.)

A. That grille we identify as the economizer inlet grille.

Q. Do you see any smoke coming out of that?

A. I see smoke coming out of the main discharge grille of the lower box; I see it recirculating and entering the economizer inlet grille.

Q. Now, I believe you testified that you installed the heater in accordance with the instructions which you identified as Plaintiff's Exhibit 1 and Plaintiff's Exhibit 2, isn't that correct?

A. We installed as closely as practical limitations would allow.

Q. I call your attention to Page 3, the second column, paragraph No. 6, marked "Fasten the front panel to the heater with screws through the slots on the inside of the panel and into the heater. The front panel should be flush [82] against the wall." Are those the instructions you followed?

A. Yes, they are the instructions we followed.

Q. Now I ask you to inspect the front panel on the several heaters. Referring to the panel on the first of the No. 67 heaters, which is the one with the partial glass panel in the back, I will ask you to inspect the top of the front panel and ask if you find that is flush?

A. It is flush according to building practices.

Q. Now I ask you to inspect the bottom of the same panel and tell me whether or not it is flush.

A. Yes, I would say it is flush.

Q. Now I ask you to inspect the right side,

Defendant's Exhibit "Q"—(Continued)

(Deposition of Warren Blazier, Jr.)

about the middle of the front panel, and tell me whether it is flush.

A. Considering that it is at the sheet metal section that is heated, I would say that it could be classified as flush, yes.

Q. Now I want you to observe that I can put my pencil in there for a substantial distance. Would you estimate the gap that I spanned with a pencil?

A. I wouldn't estimate it because it will be a function of how hot this wall is, how hot the heater is, the effects on these heaters due to the series of tests that we have conducted on them.

Q. Will you measure it for me please? [83]

A. Is this the point you are curious about?

Q. Yes.

A. In this particular heated condition today, it measures——

Q. Just tell me what the measurement is.

A. I just measured a three-sixteenths gap, at this heated condition.

Q. Now will you measure the other side and tell me what the gap is on that side?

A. It is also approximately three-sixteenths in a heated condition.

Q. Now, Mr. Blazier, will you look at the second No. 67 heater, the one that has the glass panel extending all the way, and tell me whether or not you find that the top is flush with the wall.

A. It would be considered flush by anyone who installed it, yes.

Defendant's Exhibit "Q"—(Continued)
(Deposition of Warren Blazier, Jr.)

Q. What would you say with respect to the bottom?

A. It is flush according to building practices.

Q. Now will you make the same measurements on the sides of this panel, the second 67 heater, that you made on the first one?

A. I find it is $7/16$ ths on one side and $5/16$ ths on the other in this heated condition.

Q. Will you make the same measurements with respect—well, first, tell me about the top of the 68 heater; is it flush? [84]

A. Reasonably so, yes.

Q. And the bottom?

A. Yes, it is flush.

Q. Will you make the same measurements on the sides of the panel?

A. Three-eighths, and $5/16$ ths on the other.

Q. Let's look at the No. 69 front wall panel and tell me what you find with respect to the condition of the top. A. It is flush.

Q. And the bottom?

A. It is also flush.

Q. And the side measurements again, if you will, please.

A. I would say they are flush, according to standard practice.

Q. Will you measure them?

A. One-thirty-second of an inch on one side and an eighth of an inch on the other side.

Q. Now, let's look at the back of the panel of

Defendant's Exhibit "Q"—(Continued)

(Deposition of Warren Blazier, Jr.)

the No. 69 heater, if we may. Do you find that it is flush with the wall at the top?

A. No, it is not intended to be flush at this point. This is an economizer intake.

Q. Do the instructions say anything with respect to whether or not it should be flush?

A. Well, the specifications tell you how far down, what the maximum distance the wall can extend into the unit. [85]

Q. Now I wonder if you would be so good as to measure the distance between the glass plate, which constitutes the wall at this point, and the front panel?

A. Nine-sixteenths of an inch.

Q. Would you observe the bottom of the panel on the rear of the 69 furnace and tell me whether or not that is flush?

A. The bottom can't be flush against anything because it is an air intake, which is true of any of these units.

Q. The bottom of the side is flush, is it not?

A. That's correct.

Q. What would you say with respect to the side of this panel about half way up; will you make those measurements so we may have them for the record?

A. The right side is flush; the left side is sprung a quarter of an inch.

Q. Mr. Blazier, I am going to ask you to make some observations with respect to the second No.

Defendant's Exhibit "Q"—(Continued)

(Deposition of Warren Blazier, Jr.)

67 Heater, the one with the glass back running the whole way, and I am going to ask Mr. Hollingsworth to take the wand with the titanium tetrachloride and apply it to the lower right hand corner of the heater intake.

Mr. Dawson: The question is objected to as not indicating which right hand corner, whether it is at the far end of the intake or the very back of the casing. [86]

Q. (By Mr. Christie): Now, I ask you to observe where Mr. Hollingsworth is placing the wand, and tell me where that is.

A. All right, he has placed the wand out of the normal, natural air flow.

Q. I asked you where he placed it.

A. I am telling you where he placed it. It is out of the natural flow of this unit, in the back right hand corner, behind the main air intake for the lower box.

Q. Now it's in the space within the heater, however, is it not? A. It is within the heater, yes.

Q. Now, let's close the door, and I will ask you if you will step behind and see if you can observe any smoke flow through the glass panel?

A. May I have a light?

Q. Now, will you observe the smoke pattern, Mr. Blazier, and tell me what you see?

A. I see the wand placed in the casing out of all impedances which, normally, air flow in this

Defendant's Exhibit "Q"—(Continued)

(Deposition of Warren Blazier, Jr.)

unit would be subjected to, and with the wand placed in this position at the back corner at the back of the heater casing I see a small—I did see a small amount of flow.

Mr. Christie: Will you get some more stuff on the wick, Jack? [87]

A. (Continuing): With the wand reactivated, and placed in the back corner of the heater casing away from all of the normal impedances which normal air flow would encounter, I have observed that some smoke does flow up the back wall. It starts at the bottom in the stud space but immediately it is drawn over into the central main stream, which we have observed in previous tests.

Q. Does it flow up in the economizer?

A. While it was operating I did notice that some of the flow went in to the economizer and some spilled around the economizer plate.

Q. Now, Mr. Blazier, I am going to ask Mr. Hollingsworth to repeat that test with Heater No. 68. I would also like to ask what assurance we have of what we have observed on Units 1 and 2, whether that has been observed with the correct input conditions?

A. It is correct for those heaters.

Q. Now, would you step over here, Mr. Blazier, and tell me what you see, with the wand placed in the lower right hand corner.

A. With the wand placed in the lower right hand corner at the back of the heater casing—

Defendant's Exhibit "Q"—(Continued)
(Deposition of Warren Blazier, Jr.)

Mr. Hollingsworth: Would you look at the wand again?

Q. (By Mr. Christie): Will you explain the position of the [88] wand?

A. I see what it's doing; it is all right. I wanted to be certain that he was not touching the electric wiring, which might give him a bad shock.

Q. Tell me what you observed.

A. I observed that the wand was placed just inside of the heater chamber at the base of the heater. I noticed that flow from the wand started to flow up the stud space but was drawn into the lower box.

Q. Where is the smoke coming out?

A. And I see the smoke coming out of the lower box main outlet grille, where it should, on the front. I see a small amount coming out of the lower box outlet back of the grille.

Q. That's the No. 68 heater. Now, Mr. Hollingsworth, would you place the wand in the same position on Heater No. 69 as you had on No. 68.

Mr. Dawson: May I inquire whether No. 69 is heated?

Mr. Christie: Let the record show that the gas has been turned on in Heater No. 69, and the heat has been on in the two Nos. 67 and the 68 during the course of the tests.

Let the record show a recess of approximately five minutes while No. 69 was being heated. [89]

Now, Mr. Hollingsworth, will you apply the wand

Defendant's Exhibit "Q"—(Continued)

(Deposition of Warren Blazier, Jr.)

to the same position in the heater 69 that you had in 68.

Q. (By Mr. Christie): Will you tell me where the wand is, Mr. Blazier?

A. He has placed the wand at the center of the heater on the right side, and I see smoke from the wand being drawn over and entering the lower box.

Q. Will you come and look at the grilles, Mr. Blazier, and tell me where you see the smoke issuing.

A. I see smoke leaving the main outlet of the lower box. I see recirculation occurring.

Q. Did you see any smoke coming out of the upper grille of the economizer?

A. I repeat, I see recirculation occurring and smoke coming out of the economizer as a result.

Q. Answer the question directly—do you see smoke coming out of the upper grille of the economizer on Heater 69?

A. I see smoke coming out of the economizer grille, also recirculation of the outlet air from the main outlet of the lower box into the economizer inlet.

Q. Now, I am going to ask Mr. Hollingsworth, if you will, to place tape on the sides of the several front grilles of the heaters to close the gap which the witness has measured in each case. Now, Mr. Blazier, if you will observe that the [90] gap, which you measured on the fronts of heaters, the two 67 heaters and the 68 heater and the 69 heater, that

Defendant's Exhibit "Q"—(Continued)
(Deposition of Warren Blazier, Jr.)

the gaps on the side have been covered with Scotch Tape, and I am going to ask Mr. Hollingsworth to put the wand back in this first 67 heater, the one with the partial glass back, in the same position he had it before, and I want you to tell me what the position of the wand is.

A. I see the wand is placed at the back of the heater casing, out of the main flow path or out of the air flow path which would be the normal path for operation of this unit.

Q. It is within the heater casing on the lower right hand side, is it not?

A. It is outside of the main air flow, within the heater casing.

Q. On the lower right hand side?

A. Yes.

Q. Now, will you observe the smoke pattern, and tell me what you see?

A. With the wand placed where you have it, outside of the normal area, I see smoke, some smoke in the stud space area; I see that this smoke is taking a variety of paths. One of these paths is in to the economizer; another path spills over the economizer plate, thence travels up the outside of the economizer, and the third path, which is quite significant also, passes through the vent holes at [91] the base of the economizer mounting brackets through the stud spaces. And I see that smoke being discharged through the attic vent spaces.

Q. Do you see more smoke now that the sides

Defendant's Exhibit "Q"—(Continued)

(Deposition of Warren Blazier, Jr.)

of the heaters are covered than you did previously?

A. I don't know. I don't know how big a charge of smoke you have.

Q. Will you look at the front of the heater, Mr. Blazier, you can see it from over here, and tell me what you see now?

A. I see smoke coming out of the main outlet grille of the lower box and I see smoke coming out of the economizer.

Q. Did you see any smoke coming out of the inlet grille of the economizer?

A. Not coming out of the inlet grille, no.

Q. Did you see more smoke coming out of the upper grille of the economizer than coming out of the main grille? A. At this point, I do.

Q. Quite a lot more?

A. I would expect it with the wand placed where you put it. You are forcing a high-density smoke through that area by the place you placed the wand.

Q. Look at it from here again—wouldn't you say that the smoke coming out of the upper grille of the economizer was much more than anything that was coming out below?

A. I would say that there was more coming out at the top of [92] the unit itself than is coming out of the economizer grille.

Q. You didn't answer my question.

A. At this point, with the wand where you have it placed, I see more smoke coming out of the econ-

Defendant's Exhibit "Q"—(Continued)
(Deposition of Warren Blazier, Jr.)

omizer grille and attic vents than I do out of the main outlet of the lower box.

Q. And you still haven't answered my question. I asked you to compare the amount of smoke coming out of the lower part of the furnace with the smoke coming out of the economizer grille.

A. I see more smoke coming out of the economizer grille, with the wand placed where you have it, than I see coming out of the main outlet of the lower box.

Q. Or any other outlet, below the upper economizer, isn't that true?

A. Well, yes, it would be the only outlet I would expect.

Q. Now, may we repeat this same operation on the second No. 67 furnace: that's the one with the glass extending the entire length. Now, Mr. Blazier, has Mr. Hollingsworth placed the wand in the second No. 67 heater in the same relative position that he had in the first 67 heater?

A. They appear similar.

Q. Inside the case in the lower right hand corner, correct? A. Yes.

Q. Now, let's look at the heater through the glass panel on [93] the back, and tell me what you see.

A. Well, I see the smoke being forced into the unit by placing the wand at the back of the casing at the lower right hand side——

Q. Where is the smoke going?

Defendant's Exhibit "Q"—(Continued)

(Deposition of Warren Blazier, Jr.)

A. And so it is out of the general character of the air stream. I see it starting to move up the stud spaces; about midway up the back of the lower box I no longer see any smoke in the stud space.

Q. Where is it going when it reaches the top of the lower box?

A. There is some smoke reaching the top of the lower box and some of it is going in the economizer and some of it is going through the vent holes in the base plate of the economizer and through the stud spaces. It can be seen being discharged through the attic vent.

Q. Now, will you look at the front of the installation around here and tell me what you see.

A. I see a condition which is due to the fact that you have placed the wand where you have and forcing the smoke, and I see smoke coming out of a grille that is normally provided to cool the casing of the unit and it is being drawn into the intake grille directly above, and some of it is going up the wall which is normally to be expected. I see some smoke leaving the economizer grille, but due to the presence of smoke in the region of this small grille on the side [94] panel, it is possible that leakage can occur into the economizer from this inlet on the front.

Q. Did you see any smoke coming out of the top grille of the economizer?

A. You mean the top half or the lower half? The grille is divided.

Defendant's Exhibit "Q"—(Continued)
(Deposition of Warren Blazier, Jr.)

Q. Coming out of the lower portion here; do you see any smoke coming out there?

A. Yes, I see smoke coming out and I also see recirculation; I see smoke going into the economizer inlet.

Q. Now, Mr. Blazier, we are going to repeat these same series of tests with Heater No. 68, with the wand placed inside the main casing in the lower right hand corner, and I will ask you to observe the position of the wand and tell me where it is.

A. All right. You have inserted the wand up in the stud spaces between the lower box and the wall on the right hand side.

Q. It is within the heater casing itself?

A. No, I wouldn't say it was.

Q. Is it adjacent to the primary heat exchanger of the furnace? A. It is adjacent, yes.

Q. And it is within the wall? A. Yes.

Q. Now, if you will observe the smoke at the rear and tell me if you see any smoke through the rear grille?

A. Yes, I see smoke coming through these attic vents and I would expect it with the wand placed where it is.

Q. Do you see any smoke going in to the economizer?

A. I can't say, it is difficult to observe. I see smoke swirling around on the outside of the economizer but I cannot see any going into the econ-

Defendant's Exhibit "Q"—(Continued)

(Deposition of Warren Blazier, Jr.)

omizer. I do see that it is around the outside of the economizer, however.

Q. Now, let's look at the front of No. 68, and tell me what you see with respect to the upper vent of the economizer on No. 68.

A. I see some smoke coming out of the economizer, which I would expect, and I would like to explain that, if I may.

Q. Go ahead.

A. This is demonstrating the reason for this grille; it is designed to cool the heater casing, these small vents at the top of the heater outside casing. The smoke is coming up here, which is normal; there is some recirculation; there also can be anticipated some smoke from the economizer since you are forcing the flow, and I see smoke leaving the economizer.

Q. Through the upper vent?

A. Yes, and also through this side vent.

Q. Let's repeat the test with No. 69. Do you see the position [96] of the wand in No. 69?

A. Yes, I see that it is placed up between the stud spaces of the lower section of the heater.

Q. Substantially as it was in No. 68 in the previous test? A. Yes.

Q. Let us observe. Do you see any smoke to the rear of the heater?

A. Yes, I see smoke that is moving through the vent spaces because of where you have the wand placed.

Defendant's Exhibit "Q"—(Continued)
(Deposition of Warren Blazier, Jr.)

Mr. Dawson: By vent places, you mean what?

A. I mean the vent holes provided in the bottom mounting bracket of the economizer to allow air to move through those vent holes along the stud spaces along the economizer to the attic. I see smoke in the region above the economizer inlet moving along the outside wall of the economizer toward the attic.

Q. (By Mr. Christie): Can you see—I realize there is a grille on there, but can you see any smoke going into the economizer itself?

A. Well, since there is a wall in front of me I couldn't see it if it was there.

Q. Now, looking at the front of No. 69, tell me what you see.

A. I see smoke leaving the economizer because it is being forced, the top of the economizer.

Q. Do you see any smoke leaving the outlet grille of the [97] economizer?

A. I wouldn't expect to see any, and I don't.

Q. The outlet grille?

A. I thought you meant the main outlet grille.

Q. I mean the outlet grille of the economizer.

A. Yes, I said I saw smoke leaving the economizer.

Q. Do you see any smoke leaving the main grille of the main heater grille down below?

A. I see none leaving the main grille.

Q. Do you see any smoke leaving the grille down below at all?

Defendant's Exhibit "Q"—(Continued)

(Deposition of Warren Blazier, Jr.)

A. I see some leaving the side vents.

Q. Do you really mean that?

A. I thought when I first looked at this that that was what I observed, but at the moment I see none—Yes, there I did, there a puff came out.

Q. But you have a continuous flow out of the upper outlet grille of the economizer?

A. Yes, because you have a forced continuous flow at the bottom.

Q. That's true, isn't it?

A. It is true under the conditions you set up, yes.

Q. But only an occasional puff out of the side grille of the front casing?

A. That is what I observe now.

Q. Now, a couple more questions, Mr. Blazier. Will you look [98] at the rear flange—what is the name of this?

A. This is called the economizer support bracket.

Q. In normal installation in a plastered wall, wouldn't the plaster seal off the gap between the gas plate and the economizer base?

A. That could be expected, yes.

Q. And that would be true with respect to both the No. 67 furnaces, if they were installed in a plaster wall without glass plates?

A. If you were to use wet plaster construction in place of this inspection window you would have the same interior resistances, reduction of flow area, as can be anticipated for the rest of the lower box

Defendant's Exhibit "Q"—(Continued)

(Deposition of Warren Blazier, Jr.)

section. These vent holes at the stud spaces at the base of this economizer support bracket are provided for—correction, provide a path for any air that wishes to flow up through the stud spaces to pass through, and in the case of the full wet plaster back wall you could expect the operation of those vent holes to play a more important part.

Q. Have you finished your answer, Mr. Blazier?

A. Yes.

Q. Mr. Blazier, who decided to put this installation of the floor furnaces, about which you have been testifying, in a plaster wall.

A. It was decided in a steering committee meeting with the [99] Coleman people to place the project that way.

Q. I notice over here, in this same North Laboratory, a heater which is, apparently, a Holly heater that has been placed in a dry wall construction?

A. That is correct.

Q. Isn't it true that dry-wall construction is pretty common construction, or do you know?

A. In this area it is, yes.

Q. Isn't it true that the inside of a dry wall is considerably smoother than the inside of a plaster wall, particularly on metal lath?

A. I suppose that would vary with the installation, but you might expect it to be smoother.

Q. I ask you to compare, if you will, the interior plaster, which you can see on this plastered

Defendant's Exhibit "Q"—(Continued)

(Deposition of Warren Blazier, Jr.)

wall here through the glass panel, with the character of the dry wall in this other installation?

A. The pertinent comparison is between the two glass backs.

Q. You can see the interior of the plaster wall here, can you not, and you can see the interior of the dry wall in the second installation, which is a Holly furnace. Can you tell me whether the dry wall construction is smoother than the plaster wall?

A. The dry wall construction is smoother, yes.

Q. Can you tell me whether or not it is farther away in the [100] installation from the economizer and from the furnace structure in the dry wall or in the plastered one?

A. I can't answer that because I am not certain of the thickness of the plaster in all cases and it would depend upon the thickness of the dry wall.

Q. I ask you to look down in the glass panel on the first No. 67 heater against the lower first box and tell me if the plaster doesn't abut the box?

A. Certain sections of it will abut which is as I would expect.

Q. That wouldn't be true if that were a dry wall, would it?

A. Well, are we speaking specifically, as you see here, or wall board with holes and plaster on the outside?

Q. Dry wall as we see it here.

A. Well, yes, this wet wall construction does

Defendant's Exhibit "Q"—(Continued)
(Deposition of Warren Blazier, Jr.)

close off more space at the back of the lower box than the glass wall.

Q. Are you in a position to testify on a basis of your experience whether or not an excessive quantity of plaster has been forced through the mesh in the wet wall?

A. I can only tell you this. We let a contract with a reputable firm in Wichita to plaster this wall.

Q. Who was the firm?

A. The firm name is Cramer Company, and they were not informed as to the purpose of this test—merely were told that we had a job we wanted done, and showed them the test wall [101] that they were to plaster. We relied upon their experience and their habit to do the job as closely resembling standard construction as possible.

Mr. Christie: I would like to have marked as Plaintiff's Exhibit 5 the plaster wall with the four heaters in it, about which the witness has testified. I would like to have marked as Plaintiff's Exhibit 6 the dry wall with a Holly Furnace in it, and ask the reporter to mark both walls.

(The two walls referred to were so marked by the reporter.)

Mr. Christie: Now I offer in evidence Plaintiff's Exhibits 1, 2, 3 and 4, and my offer with respect to the two physicals which were in evidence at the beginning.

Mr. Dawson: I didn't put them into evidence.

Defendant's Exhibit "Q"—(Continued)

(Deposition of Warren Blazier, Jr.)

Mr. Christie: I am offering 1 to 4 now; I put the others, 5 and 6, in evidence at the time they came up, so everything is now in evidence.

Mr. Dawson: You have offered Exhibits 1 to 4?

Mr. Christie: I have offered 5 and 6 also.

Mr. Dawson: No objection.

Q. (By Mr. Christie): One more question here, it might be a minor one but I better ask you. Mr. Blazier, with respect [102] to the second No. 67 furnace, the one with the glass panel, you notice a small flange here between the economizer and the lower box has been bent backward a substantial distance, and that it is bent considerably more than that in the other No. 67 furnace, is that correct? A. I don't know.

Q. I am asking you, as a matter of physical observation, whether or not that is not true. Can you not see that that flange on the second furnace is bent back?

A. Yes, I can see that it is bent back. I would say that, yes.

Q. Do you know the purpose of bending it back, if there was one?

A. No, I can't offer any explanation.

Q. Now, referring to Plaintiff's Exhibit 1—or Defendant's Exhibit A, I am sorry, to page 13, a picture on the right. Can you see smoke coming out of the upper economizer grille? A. Yes.

Q. And you can see smoke coming out of the main grille?

Defendant's Exhibit "Q"—(Continued)
(Deposition of Warren Blazier, Jr.)

A. No, not in the picture on the right; I see no smoke coming out of the main grille.

Q. Will you mark, if you will, with the lettering "T", the position of the smoke coming out of the economizer grille?

A. Now, you asked for the position of the pattern of the [103] economizer outlet on the right?

Q. I am sorry. I meant the left hand picture. Smoke is coming out of the economizer outlet of the left hand picture?

A. It is a little hard, but there is some flow. I have circled the flow out of the economizer outlet and have shown its total pattern which is also along this wall between the top of the heater and the economizer.

Q. Now will you mark the smoke coming out of the main grille?

A. The circulation is a little hard to show.

Q. That's my point. I don't think the picture shows.

A. You remember how it circulates except it is going to be much harder to see in these photographs.

Q. Now, Mr. Blazier, you can see the smoke coming out of the economizer grille, can you?

A. Yes.

Q. And you can see the smoke coming out of the main grille?

A. Yes, but I can't see any smoke recirculating, and I don't think you can either. I would like to

Defendant's Exhibit "Q"—(Continued)

(Deposition of Warren Blazier, Jr.)

point out that in the photograph of this whole area between the front edge of the smoke pattern of the main outlet grille on the left side clear through the main edge of the main outlet area discharged on the right side, that whole area is filled with smoke of varying density. What the photograph has picked up is the density gradient, showing a high density [104] in the main flow, and I can see that there is a haze existing in the area immediately above the economizer inlet. Now, when we observe these directly, if you get your lighting right, you can see air entering the economizer, but for the purpose of describing the character of the flow for this main unit we cannot pick that up photographically and show the character of the flow that this picture is supposed to demonstrate.

Q. In other words, the picture doesn't show the recirculation as you testified about?

A. I don't know whether it does or not. I point out this haze existing and say if that haze exists I say recirculation can occur. I don't know whether it is occurring or not.

Q. I believe you testified that the smoke is titanium dioxide?

A. That's the white particles of smoke.

Q. Do you know how the density of that smoke compares with the density of air at the same temperature?

A. The density of the smoke at the same temperature would be greater than the density of air

Defendant's Exhibit "Q"—(Continued)

(Deposition of Warren Blazier, Jr.)

—the actual quantity I can't give you specifically. I know, for the purpose of evaluating the flow pattern up the back of this model 67 wall heater with the glass-back panel, we used a heated air carbon smoke which was as light as anything could be for our test. [105]

Q. Now, was the carbon smoke still heavier than air, at the same temperature?

A. I didn't observe it to be any heavier than air since I observed no falling of particles out of the main stream. The smoke moved from the lower part of the unit up to the top and I saw no settling-out of the carbon particles in the stream. So I don't know what the relative density is.

Q. You don't know whether carbon smoke is heavier than air at the same temperature?

A. Yes.

Q. Is that a proper summation of your testimony?

A. Well, certainly, a mixture of air and carbon is going to be heavier than a mixture of pure air.

Q. And the smoke was a mixture of air and carbon, wasn't it?

A. Primarily, yes.

Q. Do you want to amend your answer, then, and state that the carbon smoke was heavier than air?

A. No, because I am not certain of the temperature characteristic—I just don't know.

Q. I am saying at the same temperature.

A. I still don't know. I told you I observed no

Defendant's Exhibit "Q"—(Continued)

(Deposition of Warren Blazier, Jr.)

settling-out of the particles and I would have expected a settling-out if the density of the smoke would have been too great for the test. [106]

Q. That isn't what I asked you.

A. Well, then, the answer to your question is that I don't know.

Q. You mentioned a steering committee of the foundation. Is it in the Coleman Company or in this foundation, the steering committee that determined how these tests are to be conducted?

A. My reference to a steering committee was our attendance at the meeting with representatives of the Coleman Company where they outlined this project for us to undertake.

Q. And who was present at the meeting?

A. I don't know—I can remember some of the people, but I can't remember all of them. Jack Kice was present.

Q. What is his position in the Coleman Company, if you know?

A. Administrative Assistant to the President.

Q. Do you remember anybody else?

A. Ray Qualley.

Q. What's his position in the Coleman Company?

A. Director of Research for Coleman. Mr. Mattingly was there; he is Assistant to Ray Qualley.

Q. Who was there from the foundation?

A. Myself, and George L. Petoff, who is a research engineer with the Wichita University Found-

Defendant's Exhibit "Q"—(Continued)

(Deposition of Warren Blazier, Jr.)

ation for Industrial Research. We were the only two representatives at that meeting from this organization. [107]

Q. Referring now to Plaintiff's Exhibit 4, for identification, isn't it true, Mr. Blazier, that smoke is free to rise in the space behind the lower box, up as far as the lower stop of the economizer, entirely across the exposed cross-section?

A. In the case of this glass wall installation, area is provided for smoke to rise if it wishes.

Q. And have you not, this afternoon, witnessed smoke rising substantially across the entire cross-section of that open space?

A. When smoke was forced into the unit I have observed that, yes.

Q. Will you explain what you mean by "forced in the unit"?

A. All right. The wick, or smoke generator, was placed at a point which was outside the area through which the normal air flow from the outside of the unit would pass. The smoke was actually injected into the space, into the stud space between the stud and the side of the lower box. This smoke did not get into this stud space by coming in to the heater through normal conditions and being subject to the up drafts and other pressures created by the burner and the lower box.

Q. Now, isn't it true that in the normal operation of this heater, smoke is not forced into the device at any point?

Defendant's Exhibit "Q"—(Continued)

(Deposition of Warren Blazier, Jr.)

A. Under normal operating conditions, if smoke is placed at [108] the front of the heater, in front of the lower inlet, it will enter under normal conditions.

Q. Now, isn't it true that the presence of the smoke within the heater, irrespective of its position, shows the air movement within the heater from that point?

A. Not necessarily; it depends upon the conditions of the smoke generator. I have no way of saying what is happening when you placed the smoke generator where you did because I don't know what the tendency of the smoke is.

Q. You saw it happen, didn't you?

A. I don't know for what reason movement occurs when you have placed a smoke generator where you have, because I do not know the character of this smoke when it is placed in this dead air region.

Q. Wouldn't you think that it is a reasonable assumption that the reason you had smoke movement, which you saw, was because there was air movement from that point?

A. I don't discount a chemical reaction.

Q. With what?

A. The titanium tetrachloride with water in the air. I don't know. That's why we generate our smoke outside the heater; we don't want that chemical reaction to take place inside the heater.

Q. What is this chemical reaction?

Defendant's Exhibit "Q"—(Continued)
(Deposition of Warren Blazier, Jr.)

A. Titanium tetrachloride, when exposed to air, combines with [109] water vapor to form hydrochloric acid and titanium dioxide.

Q. Does it do this with anything like explosive violence?

A. You can pour it in water and get quite a heavy reaction.

Q. Did you see it reacting with any explosive violence in the air, either inside the furnace or outside the furnace? A. No.

Q. Did you observe any violence?

A. The wand spits particles; it is not comfortable to be around. I don't know what you mean; what you are getting at.

Mr. Christie: That is all.

Redirect Examination

Q. (By Mr. Dawson): Mr. Blazier, may I call your attention to Plaintiff's Exhibit 6, and ask you to see whether that model forms a flush fit all the way around with the wall against which it is placed.

Mr. Christie: That question is objected to on the ground of irrelevancy. This heater is not in issue.

Mr. Dawson: It has been placed in evidence by the plaintiff.

Mr. Christie: It is further objected to on the ground that the device has been misassembled. [110]

Mr. Dawson: In answering to that, we are agree-

Defendant's Exhibit "Q"—(Continued)

(Deposition of Warren Blazier, Jr.)

able to your assembling it the way you want it. You have your expert here. Mr. Hollingsworth, in fact, a few minutes ago, placed this in position. We are quite willing to have Mr. Hollingsworth place this against a wall and see if he can make it flush.

Mr. Hollingsworth: The panel cannot be put in its normal flush position because the heater is not complete. The draw screws that are used to draw the heater back to the wall are missing from the heater.

Mr. Dawson: Would you say that your panels are always flush against the wall?

Mr. Christie: Do you want to swear Mr. Hollingsworth?

Mr. Dawson: That's all.

Mr. Christie: That's all.

/s/ WARREN BLAZIER, JR.

State of Kansas,
County of Sedgwick—ss.

Subscribed and sworn to before me, a Notary Public in and for said County and State, this 1st. day of February, 1954.

[Seal] MARY MARGARET WINGER,
Notary Public.

[Endorsed]: Filed February 5, 1954.

DEFENDANT'S EXHIBIT "S"

In the District Court of the United States, Southern
District of California, Central Division

[Title of Cause No. 15886-WM.]

PRETRIAL STATEMENT

Pursuant to the Pretrial Order of this Court of November 20, 1953, the parties to the above entitled suit, by their respective attorneys, for the purpose of simplifying the issues in the trial of this cause, agree as follows:

1. The action was commenced September 23, 1953 by the Plaintiff, Holly Manufacturing Company, a corporation organized and existing under and by virtue of the laws of the State of California, and having a principal place of business in the City of Pasadena, County of Los Angeles, State of California, against The Coleman Company, Inc., a corporation organized and existing under and by virtue of the laws of the State of Kansas, and having its principal place of business in Wichita, Kansas, and a regular and established place of business in the City of Los Angeles, County of Los Angeles, State of California, in the Southern District of California, Central Division.

2. That Plaintiff is the owner of United States Letters Patent No. 2,602,441.

3. That said Complaint charges that the Defendant has infringed said Letters Patent by the manufacture and sale of wall heaters known as Models

No. 64, 67, 68 and 69, all employing a 4-foot economizer.

Defendant denies infringement of the patent in suit by said heaters.

4. That pursuant to Stipulation, on October 15, 1954, Plaintiff served upon Defendant a First Supplemental Complaint and Defendant filed an answer thereto; that said Supplemental Complaint realleges the infringement by the above set forth wall heaters, and further alleges that since November 2, 1953, Defendant has, by manufacturing and selling wall heaters, Models Nos. 64, 67, 68 and 69, employing a new type of 3-foot economizer, infringed said Letters Patent.

The infringement by all models is specifically denied by Defendant.

5. That all of the wall heaters charged to infringe are designed to be placed between two adjacent studs in the wall of a dwelling and consist of a heater and an economizer.

6. That since November 2, 1953, Defendant has not manufactured and sold heaters with the 4-foot economizer, but all heaters have been equipped since that date with the 3-foot economizer.

7. That for the purposes of this trial it is agreed that Plaintiff will rely for his proof of infringement on the Model No. 67 with the 4-foot economizer and the Model No. 67 with the 3-foot economizer, and that if the Model No. 67 with the 4-foot economizer infringes the Letters Patent, then all models having the 4-foot economizer infringe the Letters Patent, and if the Model No. 67 with the 3-foot econo-

mizer infringes the Letters Patent all models with the 3-foot economizer infringe the Letters Patent.

8. That the Defendant's wall heater, Model No. 67, has the following parts:

(a) An outer shell adapted to be mounted in a wall of a room to extend upwardly therein from a level near the floor of the room to a level part way to the ceiling.

(b) A combustion chamber mounted in the shell and spaced from the walls thereof.

(c) A gas burner mounted to burn fuel in said combustion chamber.

(d) An opening at the bottom of the shell for introducing air thereinto adjacent the floor of the room.

(e) An opening from the shell at the top thereof for discharging air into the room from the shell near its top.

(f) An economizer mounted upon the top of the shell comprising an outer casing extending from a level just above the shell to a level near the ceiling of the room.

(g) A hot gas flue disposed in the casing and spaced from the walls thereof.

(h) An air opening at the top of the casing for discharging air from the casing into the room below the ceiling of the room.

(i) A draft hood provided with a relief opening into the room and connecting the top of the combustion chamber with the bottom of the hot gas flue.

(j) A gas flue connected to the top of the hot gas

flue to conduct the flue gases to the exterior of the building.

(k) Said wall heaters also having a baffle disposed between the combustion chamber and the rear of the shell.

(l) That the baffle provides a conduit between the rear wall of the shell and the baffle and has an opening communicating at the top with the interior of the shell.

(m) The hot gas flue is composed of flat front and rear members.

9. The claims charged to be infringed are claims 1 to 4, inclusive.

10. It is further stipulated that uncertified printed copies or uncertified photostatic copies of United States Letters Patent may be introduced and received in evidence, subject to the legal objections as to their relevancy and materiality, with the same force and effect as the originals, and that the printed dates of application and issuance of such Letters Patent shall be taken as *prima facie* evidence of the actual dates respectively thereof, subject to correction at any time for errors; and

That uncertified photostatic or typewritten copies of the file wrapper and contents, or the file history and contents, of the patent in suit may be introduced and received in evidence without further proof of authenticity, subject to the legal objections as to their relevancy and materiality, with the same force and effect as the originals and subject to correction at any time for errors.

11. It is stipulated that the deposition of War-

ren Blazier, Jr., and exhibits attached thereto, taken by the Defendant at Wichita, Kansas, may be introduced in evidence, subject to any legal objections, with the exception that the deponent is present and could retestify.

12. It is stipulated that the deposition of Henry Landsberg, taken at Pasadena, California, and exhibits attached thereto, taken by Plaintiff at Pasadena, California, may be introduced in evidence, subject to any legal objections, with the exception that the deponent is present and could retestify.

13. It is stipulated that the depositions of Sheldon Coleman, Harry Giwosky, Jack Kice and Charles Taylor Gale, and the exhibits attached thereto, taken by Defendant at Wichita, Kansas, may be introduced in evidence, subject to any legal objections, with the exception that the deponents are present and could retestify.

The contentions of the two parties which cannot be stipulated to are as follows:

1. Plaintiff contends that all models of the Coleman wall heater set forth in the above stipulation infringe claims 1 to 4 inclusive of the Letters Patent in suit.

2. Defendant contends that none of said models infringe said claims.

3. Defendant further contends that claims 1 to 4, inclusive of the Letters Patent in suit are invalid and that upon the trial of this action Defendant will rely upon the following United States Letters Patent and British Patent as an anticipation

of the invention claimed in the patent in suit or as showing a lack of invention of the patent in suit, copies of which patents accompany this statement and are marked as follows:

Exhibit C—United States Patent No. 1,361,389, issued to McLeod December 7, 1920;

Exhibit D—United States Patent No. 1,698,775, issued to Traut January 15, 1929;

Exhibit E—United States Patent No. 2,453,954, issued to Wright November 16, 1948;

Exhibit F—United States Patent No. 2,484,457, issued to Marble October 11, 1949;

Exhibit G—United States Patent No. 2,487,775, issued to Cartter November 8, 1949;

Exhibit H—United States Patent No. 139,111, issued to Briggs May 20, 1873;

Exhibit I—United States Patent No. 268,860, issued to Browell December 12, 1882;

Exhibit J—United States Patent No. 2,209,324, issued to Davison July 30, 1940;

Exhibit K—United States Patent No. 2,491,664, issued to James December 20, 1949;

Exhibit L—United States Patent No. 303,174, issued to Mason August 5, 1884;

Exhibit M—United States Patent No. 2,093,492, issued to Snyder September 21, 1937;

Exhibit N—United States Patent No. 311,313, issued to Hamilton January 27, 1885;

Exhibit O—United States Patent No. 2,102,727, issued to Maher December 21, 1937; and

Exhibit P—British Patent No. 140,989, issued to McLeod April 8, 1920.

4. Plaintiff further contends that the wall heaters manufactured and sold by Plaintiff and designated as the "NarroWall" embody the inventions described and claimed in the patent in suit.

5. Plaintiff contends and Defendant denies that Defendant's hot gas flue in the economizer has a substantially smaller cross section than the combustion chamber.

6. Plaintiff contends and Defendants denies that the casing of Defendant's heaters have an inlet opening adjacent the bottom thereof and adapted to receive air flowing upward outside of the shell and inside the wall of the dwelling.

Signed at Los Angeles, California, this 22nd day of October, 1954.

/s/ By JAMES B. CHRISTIE,
Attorney for Plaintiff
LYON & LYON,

/s/ By FREDERICK W. LYON,
Attorneys for Defendant

[Endorsed]: Filed October 22, 1954.

DEFENDANT'S EXHIBIT "V"

In the United States District Court for the Southern District of California, Central Division

[Title of Cause No. 15886-WM.]

DEPOSITION OF HENRY LANDSBERG

The Deposition of Henry Landsberg, called as a witness by the plaintiff on Monday, July 26th, 1954, beginning at the hour of 10:00 o'clock a.m., at 875 South Arroyo Parkway, Pasadena, California, before E. S. Brink, Notary Public in and for the County of Los Angeles, State of California.

Appearances: For the Plaintiff: James B. Christie, by Richard B. Hoegh. For the Defendant: Lyon & Lyon, by Frederick W. Lyon. [2*]

HENRY LANDSBERG

called as a witness by the plaintiff, being first duly sworn by the Notary Public, was examined and testified as follows:

Direct Examination

Q. (By Mr. Hoegh): State your name.

A. Henry Landsberg.

Q. What is your present occupation, Mr. Landsberg?

A. I am manager of the Process Instrumentation Group, Consolidated Engineering Corporation.

Q. How long have you been in that position?

* Page numbers appearing at top of page of original Reporter's Transcript of Record.

Defendant's Exhibit "V"—(Continued)
(Deposition of Henry Landsberg.)

A. The particular position, about a year. Prior to then I was manager of just the Titrilog section for two years before then.

Q. In general what are your duties now in your present position?

A. There are actually two groups within the group. One pertains to the Titrilog, which is the instrument we will use in this test. That was in carrying on the development of the instrument and handling a rental program with the instrument and also making tests regarding the usefulness of the instrument. And then the other group is in a new mass spectrometer which Consolidated manufactures and that is an application group, in which case we study the instrument and determine the various applications for [3] which the instrument is suitable.

Q. You are in direct charge of both of these groups, is that correct? A. Right.

Q. How long have you actively used or been associated and used the Titrilog?

A. Approximately five years.

Q. When did you first come to Consolidated?

A. August, 1949.

Q. What formal education have you had in engineering and chemistry?

A. I am a graduate in chemical engineering from Rice Institute, Houston, the year of 1935.

Q. 1935. Generally what has been your experi-

Defendant's Exhibit "V"—(Continued)

(Deposition of Henry Landsberg.)

ence from the time you left there until the time you went to Consolidated?

A. I was an engineer for Magnolia Petroleum Company in Dallas, Texas for six years. I was in the Army for four years, Commander of a mobile petroleum testing laboratory. Then for a short period of time after the war I was in the plastics business prior to my joining Consolidated.

Q. What subject did you concentrate on in Rice Institute? A. Chemical engineering.

Q. Have you written any papers or published any papers or read any papers concerning the operation of the [4] Titrilog?

Mr. Lyon: What is the name of this machine?

A. Titrilog.

Mr. Lyon: Thanks.

A. Yes, I gave a paper at the American Chemical Society in September last year at Chicago. That paper is presently published in the current issue of Industrial Chemical Engineer—Industry Engineering Chemistry. There have been previous papers written on the instrument, too.

Mr. Hoegh: Q. By you?

A. Not me, not me.

Q. In connection with other people?

A. Yes. Not by myself. Other people connected with the early development of the instrument.

Mr. Kice: You say the current issue of this magazine?

A. Yes.

Defendant's Exhibit "V"—(Continued)
(Deposition of Henry Landsberg.)

Mr. Hoegh: Q. Do you know the date of it?

A. The July issue.

Q. Would you briefly describe how the Titrilog works, Mr. Landsberg?

A. The Titrilog was developed originally for the chemical warfare service in the United States Army to determine or trace quantities of sulphur compounds in atmosphere. That is mustard gas, being a sulphur compound. The instrument operates on the general principle of a [5] chemical analyses by oxidation-reduction with bromine. Now, the way we do it in the Titrilog is that gas is drawn through the titration cell which is the heart of the instrument. It is drawn through a sulphuric acid electrolyte that contains potassium bromide salt. Bromine is generated electrolytically. At the start of an operation the air or gas that is introduced into the cell is sulphur free, either by taking it from the atmosphere, or if there is any question of the air containing any sulphur, it is scrubbed through a charcoal soda lime filter. During that time a small amount of bromine is generated. Since there is no sulphur compound going into the cell, there is no reaction. So the bromine that is generated sets up a voltage across two center electrodes. That voltage is opposed by another voltage from a battery which is equal and opposite so that a null is developed, a balance. Upon the introduction of a gas containing sulphur compounds which will react with the bromine, bromine will do so

Defendant's Exhibit "V"—(Continued)

(Deposition of Henry Landsberg.)

and thereby destroying the balance. The titration cell is hooked in a series with an amplifier, a feed back system, so that the setup must remain in balance at all times. So when the balance is destroyed a signal results, it results in a signal being sent to the amplifier which increases the bromine generation to satisfy the reaction as well as this initial setting. The difference between the initial setting, which we call the zero level, and the [6] level during titration is due to the titration of the sulphur with the bromine. I have neglected to say that all of these readings are simply the generating current of the bromine, the bromine being directly proportional to the amount of generating current, and we are recording then the milliamps of generating current. We have had these instruments in the field for the last four or five years on various types of applications such as monitoring the gas, natural gas, coming from the West Texas field that is being treated, and it is essential that the sulphur be removed from this gas before it is introduced into the pipe lines because of the corrosive nature of hydrogen sulphide, so the Titrilog is being used in plants. So many gas companies use the Titrilog since the natural sulphur compounds have been removed from the gas, then natural gas becomes relatively odorless in which case it will be dangerous in that it would not be detected if there was a leak present in a home. So many gas companies introduce a relatively non-corrosive sulphur compound

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so the mercaptan or hydrogen sulphide, which have a very high odor level, and they monitor the injection of it with the Titrilog in order to make certain that a sufficient amount is introduced, but not too much. And that is a fairly critical level in that too much will cause an excessive number of complaints due to leaks which are really insignificant.

Q. What is the sensitivity of the instrument?

A. The instrument is sensitive enough to record concentrations certainly as low as one part in ten million, and in many cases even more so. That is one of the—because of that extreme sensitivity the instrument is being used quite extensively in many areas in air pollution studies where sulphur dioxide is the more prominent pollutent.

Q. What is the accuracy of the instrument?

A. It is determined by calibration. And in this paper, one of the important—one of the prime reasons for the paper is discussing the accuracy of the instrument in that in many applications the instrument is not calibrated more often than once a month. And by extensive testing over a two month period on four instruments, we have determined that the accuracy of the Titrilog if calibrated once a month is about 16 per cent. If calibrated once a week I think it was around 7 per cent, and if calibrated daily it is around 3 per cent. That is 3 per cent of your reading.

Q. Well, the instrument will show differences in the concentration of the sulphur dioxide?

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(Deposition of Henry Landsberg.)

A. Practically instantaneously.

Q. Does the time lag between the taking of samples as to what you want to compare it with on two concentrations have any effect on the accuracy when you are comparing?

A. No, that is the way the instrument is generally [8] operated, on cycle period, whereby it will record, for instance, in cases of air pollution it will record the concentration in the atmosphere and periodically the air will be drawn through a charcoal filter in order to get the—reestablish reference levels. That is where extreme accuracy is being attempted, to get the most accuracy out of the instrument and also extremely small concentrations. Generally in the level of two tenths parts per million.

Q. How is the sample drawn into the instrument, Mr. Landsberg?

A. The sample is drawn into—there are two methods of sampling with the Titrilog. I will describe only the method we have used here, in that a pump—in order to make certain that no sulphur compound is given off or taken up by the sample, it is not put through a pump prior to introduction in the titration cell, but it is pulled through the pump. The volume is controlled by critical flow orifice downstream of the cell and that is set at approximately a thousand cc's per minute.

Q. As the sample is being drawn through are

Defendant's Exhibit "V"—(Continued)
(Deposition of Henry Landsberg.)

there continuous readings made of the SO_2 concentration?

A. Right, as the sample is being continuously drawn through a fritted glass stem in the cell, the gas is dispersed and reaction takes place on a practically instantaneous basis. [9]

Q. Getting to the test we are going to conduct today, what devices are being tested with the Titri-log; what actually will we be running tests on?

A. We are making tests on two Coleman wall furnaces, Type 67, I think.

Q. Do you know the difference between the two types?

A. This one here on the left has a heat exchanger, secondary heat exchanger, is it?

Q. Yes.

A. Of four feet and the one on the right three feet.

Mr. Lyon: Can I ask a question on voir dire?

Mr. Hoegh: Any time, Mr. Lyon.

Mr. Lyon: On the operation of this machine. You have to draw the gas into the machine, don't you?

A. Right, sir.

Mr. Lyon: And now you have talked about the accuracy in it, but does that vary as to the quantity of gas that is going through?

A. The quantity of gas is fixed by the critical flow orifice.

Mr. Hoegh: Get up if you wish. If you want to

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(Deposition of Henry Landsberg.)

take a look, if you have any questions at all, Mr. Lyon——

A. I think perhaps I can show it on the pad easier.

Mr. Lyon: But you have to have a constant volume? A. That's right.

Mr. Lyon: That's all. [10]

A. We have to have a constant volume and critical flow orifice will do that.

Mr. Lyon: All right.

Mr. Hoegh: Q. What are the tests which we are going to conduct on these devices designed to show, Mr. Landsberg?

A. We are going to introduce a small amount of sulphur into the air that is being drawn in the bottom portion of the furnace. We will test that air for the sulphur concentration in the back of the furnace and then test the air as it comes out of the—what do you call that?

Q. Upper discharge grille.

A. Upper discharge, and attempt to show the amount of dilution which has taken place during its travel.

Mr. Lyon: You have to put a suction on that?

A. No, sir. The suction is practically nil. It is on the order of two or three inches of water.

Mr. Lyon: But you are drawing a thousand cc's——

A. Per minute.

Defendant's Exhibit "V"—(Continued)
(Deposition of Henry Landsberg.)

Mr. Lyon: Per minute of air out of the machine and any place you make a test, aren't you?

A. Right.

Mr. Lyon: All right.

A. I say there is a suction of two or three inches of [11] water, that is a maximum suction. When the cell is open to the atmosphere or to an atmosphere of gas, I doubt if it is that high a vacuum.

Mr. Lyon: Do you have any way of telling what that vacuum is?

A. It perhaps could be measured by a draft gauge but with so low a vacuum and the full capacity of the air being available, I doubt if you could even see any vacuum.

Mr. Hoegh: Q. Would you describe how the tracer gas is injected, Mr. Landsberg?

A. The tracer gas is being injected into an atmosphere in front of the air intake of the furnace from a bottle of pure SO_2 sulphur dioxide, through a very fine capillary, and being dispersed in this tunnel with a slow moving propeller that has no pitch.

Mr. Lyon: Propeller without a pitch?

A. It is a mixing blade.

Mr. Lyon: Oh, just a mixing blade.

Mr. Hoegh: Q. Would you explain the purpose of this slot in front of the tunnel, please, Mr. Landsberg?

A. The slot was placed there so as to create a forward draft into the furnace, although it is more

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(Deposition of Henry Landsberg.)

than ample to supply the necessary amount of air to the furnace.

Mr. Lyon: Are these two furnaces at their regular critical operating level now?

Mr. Hoegh: They are as high as we can get them. [12] This one Mr. Landsberg has checked the input on it, and I would like to ask you——

Mr. Lyon: I mean, are they being heated now?

A. Yes.

Mr. Hoegh: Q. How long has this one been on?

A. This one has been on since I have been here, which was about 9:15, it was before then, and we computed the wet meter; on the basis of the wet meter and the B.T.U. constant of the gas, there is approximately 30,000 B.T.U.'s per hour.

Q. Would you describe the location of the sample points which will be used, Mr. Landsberg?

A. There are four sample points in the back labeled one, two, three, and four. Those are the sample points of the air before it has had a chance to be diluted and then we will check point five which is the outgoing air through the vent, the three positions called 5A, B, and C. Then we will check around points 7 and 8 to make certain that some of the gas, affluent gas from this portion of the furnace is not being drawn in through these other—what do you call them?

Q. Inlet grilles on the top of the outer case of the box. By this portion, you referred to the main discharge grille?

A. Main discharge.

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(Deposition of Henry Landsberg.)

Q. Would you begin the actual test now, Mr. Landsberg, [13] starting with taking a reading of the atmosphere? I might ask what the plots on there represent.

A. As I mentioned before, we are recording the milliamperes of generating current of which the bromine concentration is a direct function. Right now we are just drawing atmospheric air into the cell and the zero level has been established at 13 units. I don't think we will attempt to convert readings here into concentration since it is a relative type test, so your net titration level here would be indicative of the relative concentrations of the point at which we will test. Right now we have established the zero level. In order to make these tests a little clearer, when we start testing we will speed up the chart so it will move faster. All right.

Mr. Lyon: Is this dial up here the one that you are saying is 13? A. Either one.

Mr. Lyon: I can see it. Thank you.

A. Each small division is two tenths of a unit, two hundredths of a unit.

Mr. Hoegh: Q. The reading you get for atmosphere is what?

A. The reading I have for atmosphere is 13 divisions.

Mr. Lyon: Is that the pipe where the clean air is drawn in?

A. Yes, the tubing. Clean air is being drawn through [14] the tubing here.

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(Deposition of Henry Landsberg.)

Mr. Lyon: What size is that?

A. Quarter inch.

Mr. Lyon: What volume of air is being pulled through?

A. One thousand cc's per minute is always being drawn through the cell regardless of the size of tubing in that that is a critical flow orifice stream of——

Mr. Lyon: Then any time this machine is operating today we can say it is a thousand cc's being drawn into it? A. Right.

Mr. Lyon: Thank you. That is a fixed volume.

Mr. Hoegh: Q. Perhaps we better explain what a critical flow orifice is.

A. Critical flow orifice is an orifice which if the downstream pressure of the orifice is less than half of the upstream pressure, the flow through the orifice will remain constant regardless of what the downstream pressure will do. High changes. As long as it remains less than half of the upstream pressure. This pump is pulling—can pull a vacuum on the downstream side of the orifice, not in the cell, as high as 18 inches of mercury vacuum. The upstream pressure is always the atmospheric because it is open to atmosphere. Therefore, we have less than a half ration there, so critical flow conditions exist.

Q. Would you begin taking samples of point number 1? A. All right. [15]

Defendant's Exhibit "V"—(Continued)
(Deposition of Henry Landsberg.)

Mr. Lyon: Are you connecting this, sir, or is somebody else?

Mr. Hoegh: This is Mr. Percy helping.

Mr. Lyon: During this test on this Coleman furnace, is the standard Coleman heater fired?

Mr. Hoegh: Yes.

A. At 30,000 B.T.U.'s per hour.

Mr. Lyon: How did you rate that 30,000?

A. We measured the cubic foot input of the gas into the furnace for a half a cubic foot to determine the number of seconds. That divided into the 3,600 seconds contained in one hour times the reading—times two, since this is only a half a foot, would give you the number of cubic feet to be injected into the furnace. That times the B.T.U. content of the gas, which is eleven hundredths per thousand cubic feet, times a factor of point nine which corrects the gas in volume due to temperature conditions will give you the B.T.U. content per hour.

Mr. Lyon: How was the B.T.U. of this gas determined?

A. I think there was a test made here in the plant as being at approximately eleven hundred. But also——

Mr. Lyon: You don't know?

A. I don't know that, but I know that the gas company rates their gas at somewhere between a thousand and eleven hundred B.T.U.'s generally.

Mr. Lyon: All right. I am ready. [16]

Defendant's Exhibit "V"—(Continued)

(Deposition of Henry Landsberg.)

Mr. Hoegh: Well, we are now taking gas into the Titrilog from point number 1. I would like to ask you to make a reading of that, please, Mr. Landsberg.

A. All right. The reading for point number 1 we can average out as this chart has been moving at a faster speed which indicates, any little wiggles, a slower speed. I would average this at, oh, approximately 73 divisions which, subtracting the zero level from that will yield a net titration level of 60 divisions.

Mr. Hoegh: Q. Will you switch now to point number 2?

A. All right. Let's get a zero level.

Mr. Lyon: Are you injecting SO_2 now?

A. Yes.

Mr. Lyon: Thank you.

A. Note the response of the instrument. Open it up to the other atmosphere and it immediately returns to a zero level.

Mr. Lyon: Mr. Witness, don't I read this zero level nearer 15?

Mr. Hoegh: Mr. Lyon, we are going to need the services of Mr. Percy who came along to hold this tube. The witness just can't read it and hold it, too.

Mr. Lyon: I mean, when you look this square on it is nearer 15.

A. Right now it is nearer 15 because the tube has some gas in it. In other words, there is a small reading. [17] Now, we do not. We establish this

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zero level. We can use this one and if we use that one then on the others, the difference nullifies practically, in fact. True zero level will exist in the instrument because that is determined by this battery voltage. Are you on 2 now?

Mr. Hoegh: Q. Are you taking a reading from point number 2 now?

A. Point number 2. I better mark this. You notice he has the tube only flush with the back surface.

Q. Would you read the reading per point number 2, please, Mr. Landsberg?

A. Let it average out a little bit longer. All right.

Mr. Lyon: Couldn't we agree on the reading at about 70?

A. It is all right with me. I think it would be a good idea if we did agree, because of the eye, to agree on the readings. 70. So that is a net reading of 57.

Mr. Hoegh: Q. Would you now place the pick-up on point number 3? Is it on point number 3 now, Mr. Landsberg?

A. It is on point number 3.

Q. Would you take the reading on point number 3 now, please?

A. That is number 3. All right. Average that about 73 or 74, wouldn't you?

Mr. Lyon: Yes.

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A. 73 makes the subtraction easy. That would be [18] 60 divisions net.

Mr. Hoegh: Q. Place the pickup at point number 4, please. Would you read the reading from sample point number 4, please?

Mr. Lyon: Call that 24, don't you?

A. Agree on about 24?

Mr. Lyon: Yes.

A. That is a net of 11.

Mr. Lyon: Would you mind putting it back on number 1 for just a minute or two?

A. All right. Put it back on number——

Mr. Lyon: You better mark this as number 4. Averaging about 70 again, the same as it was before, isn't it? A. 72 or 73.

Mr. Lyon: All right. Go ahead with whatever you want again. A. All right.

Mr. Hoegh: Q. Would you now take a sample at points 5A, B and C?

A. We will take samples of 5A, B, and C and on this grille we label the three different points across.

Mr. Hoegh: The upper grille there.

A. Is it the upper or lower? The upper grille. And we will use a funnel so we will get more of an average reading across there. [19]

Mr. Hoegh: I notice a funnel has been attached to the end of the pickup tube. Could you explain the reason for that?

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A. To get more of an average reading across the entire—the upper one.

Mr. Hoegh: No, that's right.

A. All right.

Q. What is the point over which or from which the sample is being taken now?

A. 5A. The point is 5A. All right, Earl, take it away for a second to make a break in the chart.

Mr. Lyon: Would you say that is about 50?

A. 50, which would be a net of 37. All right.

Mr. Hoegh: Q. What is the point from which you are taking a sample now?

A. 5B.

Mr. Lyon: Can we agree on about 29 on that one? A. 29. That is 16.

Mr. Hoegh: Q. 16 is the reading for point 5B?

A. Yes.

Mr. Lyon: Well, the machine read 29. I mean, we are not—let's not subtract it now. I want to keep the record clear of what the machine read.

Mr. Hoegh: Q. What sample point are you using now, Mr. Landsberg?

A. 5B. These changes in concentration, these wiggles [20] are very small, down below, it is seven parts per million.

(Discussion held off record.)

Mr. Lyon: Would you be willing to call that what? A. Oh, I don't know.

Mr. Lyon: About the same, 49?

A. 49, yes.

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(Deposition of Henry Landsberg.)

Mr. Hoegh: Q. That is for point 5C?

A. 5C, 49. That is 36. Now, just to make sure——

Mr. Hoegh: Q. As a check, would you take the funnel off and probe the last one, please, 5C?

A. 5C without a funnel.

Q. Yes.

A. All right. This is 5C without a funnel just to show it is a similar reading.

Q. Would you pull it towards you?

A. Towards you.

Mr. Lyon: About 46. A. 46, yes.

Mr. Lyon: About 46.

Mr. Hoegh: Q. That is 5C without a funnel?

A. All right.

Q. Would you now check points 7 and 8, please, Mr. Landsberg?

A. We are checking 7 and 8, not what is coming out of there but what might be going in.

Mr. Lyon: You better mark where that is coming from. [21] A. Yes.

Mr. Lyon: Is that about 20?

A. About 20, yes. That would be 7.

Mr. Hoegh: Would you now take a sample of point number 8?

Mr. Lyon: What caused that big violent swing when he changed that? A. Which is that?

Mr. Lyon: It went clear through 28.

Mr. Hoegh: He may placed it out in the stream.

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A. He pulled it away and probably got more of the gas coming out of the upper portion.

Mr. Lyon: Out of the main lower grille?

A. Yes, the concentrating coming out of there is approximately—that is probably the reason for this, too.

Mr. Lyon: This one is running around 19. You better mark the place you are taking this from. Number 19—or 8, isn't it? A. Yes.

Mr. Lyon: What do you estimate that one at, the reading? A. 20, I guess.

Mr. Lyon: Will you go 20 on that one? All right. Agree that was 20.

Mr. Hoegh: Q. Would you run through a calculation of the amount of dilution of the air coming up the back that occurs in the air which is discharged from the upper [22] outlet grille, please?

Mr. Lyon: Are you going to make any more tests? A. We can.

Mr. Lyon: May we have a test? Where is the main volume of outlet in the Coleman furnace? Can we ask that of Mr. Kice, where the main volume of outlet is to the best of his knowledge, so we can make a test at that point?

Mr. Hoegh: Yes, if you wish to indicate there, Mr. Kice.

Mr. Kice: That would be it.

Mr. Lyon: Put your hand on it and we will take a reading there. If we use the funnel where do you think we would get the biggest volume of air? I

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will mark a little 1 under one of them and two dots under the other one, so X one dot and X two. Mr. Witness, can we make a testing at those two points with the funnel? A. Yes.

Mr. Hoegh: Q. Where is the funnel now?

A. At point number——

Mr. Lyon: X1.

A. X1 are you calling that?

Mr. Lyon: Yes. Will you mark the chart now? That is X1 that it is reading on now. Thank you. Can we agree that that reading is approximately 62?

A. Right. [23]

Mr. Lyon: 62. Now, will you try it—let it go to zero and then try X2. Can we say that that is approximately 65?

A. Yes, that is close enough.

Mr. Lyon: 65 he reads on that, he agrees on that one. Now, to get the test on all the places on this machine, I notice you have a tube opening at the very bottom down here, the tube right in the center of the block here. Where does that lead to?

A. Are you asking me?

Mr. Lyon: Yes.

A. Those tubes are not for the purpose of this test. Those are for the purpose of injecting, what was it, titanium tetrachloride.

Mr. Lyon: Are they open now? A. Yes.

Mr. Lyon: Can you get a reading out of there?

A. I imagine we can.

Mr. Lyon: Will you try it? You are now going

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to make a test at a tube that goes in adjacent to the burner approximately—no, wait a minute now. Where would you describe that, Mr. Landsberg?

A. Which one did you want? This one is coming in and up to here.

Mr. Lyon: Where does this one go?

A. Straight through. [24]

Mr. Lyon: Where to?

A. Into the bottom.

Mr. Lyon: Just under the burner?

A. Just under the burner.

Mr. Lyon: Thank you. Will you now give us the reading, as soon as you can make it, of that position? A. 22?

Mr. Lyon: It is okeh with me. Just write "under the burner" up there, if you can. Now, Mr. Witness, where in this whole setup other than directly coming out of the SO₂ tank would you say you would have the greatest concentration of SO₂?

A. Where?

Mr. Lyon: Yes.

A. Would the greatest concentration be? In the atmosphere in front of the furnace intake.

Mr. Lyon: In front of the furnace intake. Can we make a reading there? A. Sure.

Mr. Percy: Where do you want it?

Mr. Lyon: I want it wherever Mr. Landsberg says there is the greatest concentration in that machine.

A. Well, I will qualify that, as far as greatest

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concentration, I would say the greatest concentration would be there or there, very close to being equal.

Mr. Lyon: That is the input of the input of the [25] machine there we just tested?

A. No, I would say that is a false reading. I would question that reading in that your natural draft is up this way and this tube is right here, so I question——

Mr. Lyon: Well, can you get a measurement of the volume? I don't mean the volume, but of the concentration of the SO_2 that is going into this machine?

A. Yes, we can take it right in front of the furnace there.

Mr. Lyon: Will you do that, please?

Mr. Hoegh: Will you indicate, Mr. Landsberg, where the holes should be drilled?

A. Let's drill one right in there, somewhere.

Mr. Lyon: The place you are indicating that you are now going to drill a hole, I take it?

A. Yes.

Mr. Lyon: Is approximately four inches in front of the outer grille of the Coleman heater through the box which is approximately 30 inches high and three times as wide as the whole Coleman grille, and what is the length of this box?

Mr. Hoegh: The scale is right there, Mr. Landsberg.

Mr. Lyon: Let's just get the dimensions of this

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box so there will be no argument there later. Six feet long. Four feet wide. And 30 inches high. And the Coleman grille is 15 inches, is that right? [26]

Mr. Hoegh: Yes. Now, take a sample at a point which we will mark number 11.

Mr. Lyon: That is the point I just identified as being four inches in front of the grille, of the Coleman grille, in the center of this box we just measured.

Mr. Hoegh: Yes.

Mr. Lyon: The tube has been run in approximately how far?

A. A little more, more. That is good.

Mr. Lyon: How far in is the tube placed approximately?

A. The tube is about a foot from the floor.

Mr. Lyon: Thank you. This is point 11 that we have been describing. About 60? About 62?

A. Well, since that is the point of injection, I think an average over a little bit longer period might be more representative since this is where your air is being drawn.

Mr. Lyon: All right. It is going on. About 60.

A. About 60.

Mr. Lyon: We agreed it reads about 60.

A. Do you want to move this about any, or leave that as a point?

Mr. Lyon: What?

A. Did you wish to move that about any?

Mr. Lyon: No, that's all right with me. Is there

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[27] any way we can take one of the flue outlet way up at the top?

Mr. Hoegh: I think so if we can connect up the tubing, Mr. Landsberg. We have a very high ladder here.

A. Yes, we have some more tubing.

Mr. Hoegh: What point are you sampling from now?

Mr. Lyon: Approximately the center of the flue.

Mr. Hoegh: Approximately the center of the flue?

Mr. Lyon: Yes. All right. Can we get a reading now? A. All right.

Mr. Lyon: Average about 16, isn't it?

A. Yes.

Mr. Lyon: 16. Now, can we test it right there at the outlet into the attic? They should be approximately the same, shouldn't they? Those are the attic vents. Would you say that is about 14?

A. 14.

Mr. Lyon: That is all right with me.

Mr. Hoegh: Did you wish to check any more points up there?

Mr. Lyon: No, I don't.

Mr. Hoegh: Q. I wish to ask one thing, Mr. Landsberg. In sampling points 5A, B, and C, I noted a difference in the readings. Was there any attempt to check the air velocity coming out of the upper discharge grille at those [28] various points?

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A. Yes, we checked that last week and found it to be pretty uniform across there.

Q. What instrument did you use to make those tests, the pressure-ammeter?

A. I think that is what it was.

Mr. Lyon: Did you make the tests?

A. I was present when the tests were made.

Mr. Hoegh: A hot wire anemometer.

Mr. Lyon: Have you measured the volume of air going into this unit? A. No.

Mr. Lyon: Or the volume coming out of any of the discharge points? A. No.

Mr. Lyon: I have no more places I want tested.

Mr. Hoegh: We wanted to run various tests on the Coleman 67 with the three foot exchanger. It is now ten to twelve.

Mr. Lyon: Let's go to lunch.

Mr. Hoegh: One thing we would like to do is run some smoke through the 67 with the four foot exchanger while this is on.

Mr. Lyon: What is he going to do, put tetrachloride in there?

Mr. Hoegh: The actual smoke is titanium oxide.
[29] Would you describe the location of the point of injection there, please, Mr. Landsberg?

A. The point of injection is in the center of the back portion of the furnace about one foot up.

Q. What is the direction of injection?

A. Up—or actually out. The injection tube is a quarter inch tube with small holes on the side.

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(Deposition of Henry Landsberg.)

Q. Would you, Mr. Percy, please, or I will, I will operate this smoke generator. Would you observe the smoke coming out of the discharge grilles, please, Mr. Landsberg?

A. The smoke can be seen coming out of the discharge grilles.

Mr. Lyon: Actually in this test aren't you forcing that air into the compartment or that smoke into the compartment?

A. It is being forced in somewhat, yes.

Mr. Hoegh: Q. How would you account for the flow of the smoke up along the back?

Mr. Lyon: Would you do that again? I want to see something. The same way you were running it before. Where is the leak up there that that is coming from? I call your attention, gentlemen——

Mr. Hoegh: You may ask the witness. There is no secret.

Mr. Lyon: I call the witness' attention to the fact [30] when he made that test that there was some smoke. Well, he is standing out here. Would you do it again?

Mr. Hoegh: Will you do it again, please? Would you describe all the points from which smoke is emitting at this point, Mr. Landsberg?

A. I see smoke coming out of the discharge grille and I see smoke coming out of the proximity of the attic vents.

Mr. Lyon: Do you see any smoke coming out of the main flue?

Defendant's Exhibit "V"—(Continued)
(Deposition of Henry Landsberg.)

A. The top of the flue? I don't believe I did. Try it again.

Mr. Lyon: Did you see any smoke coming out of the main grille which is about shoulder high?

A. I didn't observe that. Would you try it again, please? No, I didn't.

Mr. Lyon: This smoke was emitted into the space above the bottom edges of the lower heat exchanger, was it not, and above the intake grille?

A. I don't quite follow you.

Mr. Lyon: Well, we can see it on this one point. You are emitting this smoke on the intake grille which I point out is below, down here around the burner, is it not?

A. Well, on the intake grille on the outside, it is up to here. [31]

Mr. Lyon: I didn't ask that. I said the main intake grille.

Mr. Hoegh: Through the front.

Mr. Lyon: To this heater. I will point out and ask you if this black shoulder, when you open the lower grille, is not the bottom edge of that, is not the bottom intake of this heater? A. Yes.

Mr. Lyon: And none of this smoke was allowed to go up through the main portion of the heater in your last test? A. No.

Mr. Lyon: Thank you.

Mr. Hoegh: Q. How do you account for the emission of smoke from the upper discharge grille, Mr. Landsberg?

Defendant's Exhibit "V"—(Continued)
(Deposition of Henry Landsberg.)

A. There evidently must be a draft up through there. It didn't go by diffusion in that titanium tetrachloride is considerably heavier than air.

Q. Would you move the smoke generator to one of the other smoke inputs over there?

Mr. Lyon: How much heavier than air is titanium oxide?

A. Tetrachloride. I don't recall the gravity of titanium. Do you, Earl? I would say roughly, certainly more in that the molecular weight of air is 29, the oxide of titanium would be 32, titanium I don't recall, so I [32] would guess roughly on the order of twice.

Mr. Lyon: Now, have you tried injecting smoke into the true inlet of this Coleman heater?

A. No.

Mr. Hoegh: What would you call the true intake?

Mr. Lyon: Where is the inlet on a Coleman heater for air?

A. The bottom portion here, through here, and underneath.

Mr. Lyon: And have you ever tried any smoke tests there? A. No.

Mr. Lyon: I haven't any more questions now.

Mr. Hoegh: We wish to inject smoke on the side of the heater that is now in operation. Would you describe the point at which smoke is now being injected?

Defendant's Exhibit "V"—(Continued)
(Deposition of Henry Landsberg.)

A. This is a point between the heater and the wall, side wall, approximately one foot up.

Mr. Lyon: Is that point above the normal inlet for the air to this furnace?

A. Yes, slightly.

Mr. Hoegh: Q. When smoke is—I might ask in what direction is smoke injected in this?

A. The smoke will be injected here like as in the first case, through an opening in the tube that is on the side, that is, the opening is on the side of the tube. [33]

Q. The smoke is injected laterally?

A. Laterally rather than vertically.

Q. Would you observe the smoke outlet?

Mr. Lyon: You can let somebody work that if you want.

Mr. Hoegh: Q. Would you describe all the points from which smoke is emitting?

A. I see smoke coming out of the upper vent and also in the proximity of the attic vent.

Q. Would you describe the path of the smoke as it comes up from the point of injection along the back of the lower box, please?

Mr. Lyon: Would you smoke that up again? Oh, I see it. Go ahead.

A. The smoke travels vertically about half way up the furnace between——

Mr. Hoegh: Q. Where?

A. Between the furnace and the wall, and then it begins to diffuse.

Defendant's Exhibit "V"—(Continued)

(Deposition of Henry Landsberg.)

Mr. Lyon: I am going to ask the witness to come up here and observe something.

A. Half way across the back of the furnace between the back wall of the furnace——

Mr. Lyon: Now, will you make that smoke, please? Now, Mr. Witness, isn't it a fact that smoke is not coming out of the grille up there but is coming through between the [34] wooden backing that you put here and the furnace itself?

A. Yes, it is.

Mr. Lyon: Thank you. I would like Mr. Kice or Mr. Blazier to get up and make an examination of this while the smoke is going up. Are you satisfied with what you see, Mr. Blazier?

Mr. Blazier: Yes.

Mr. Hoegh: If you don't mind, I will take a look.

Mr. Lyon: What?

Mr. Hoegh: If you don't mind, I will take a look.

Mr. Lyon: Will it be cooled down by tomorrow so we can see it?

Mr. Hoegh: Yes. I think we might as well turn it off now.

Mr. Lyon: I have a question for the witness. Does titanium oxide in any way affect this instrument you have been using, to your knowledge?

A. No. We can prove that if you like.

Mr. Lyon: Let's take a test. I would like to see what happens.

Defendant's Exhibit "V"—(Continued)
(Deposition of Henry Landsberg.)

Mr. Hoegh: Q. At what point are you sampling now, Mr. Landsberg?

A. Number 4, I believe it was. No, number 3.

Mr. Lyon: If it had any real effect it would bounce it hard with that amount of concentration.

A. Yes. [35]

Mr. Lyon: All right. Give it some smoke.

A. I see smoke going right by the point of sampling.

Mr. Lyon: It has substantially no effect that I can observe or you can on your machine.

A. Right.

Mr. Lyon: Thank you. Now, may I ask counsel a question?

Mr. Hoegh: Certainly.

Mr. Lyon: Will it be possible to have this graph that we have taken this morning, shall we draw a line across it and mark that the recess period, and don't try to take it off now, but after we are through with these tests will you introduce that graph as an exhibit, please?

Mr. Hoegh: Yes.

Mr. Lyon: And the morning series will be Exhibit 1 to the deposition.

Mr. Hoegh: Would you like to mark it now, Mr. Reporter, before it moves on by?

A. I will stop it.

(Whereupon the portion of the graph indicated was marked as Plaintiff's Exhibit 1 by the Notary Public.)

Defendant's Exhibit "V"—(Continued)

(Deposition of Henry Landsberg.)

Mr. Hoegh: Mr. Lyon, I would like to point out for the record that the heater with the three foot exchanger is turned on and will be left on through the noon hour.

Mr. Lyon: All right.

Mr. Hoegh: It is now 12:00 o'clock. [36]

Mr. Lyon: We will recess until 2:00.

(Discussion held off record.)

A. Notice the zero level has not been repeatedly jumping. The zero level is at 13.

Mr. Lyon: Yes, it seems to go down there.

Mr. Hoegh: Mr. Lyon, I had some pictures taken which show the sample points. I don't see why we can't stipulate that they represent what we have seen here and avoid calling the photographer now.

Mr. Lyon: Oh, yes, we can do that. Can you give us a set to look them over?

Mr. Hoegh: I notice one here, Mr. Reporter, which shows the SO₂ bottle and the paddle wheel showing the method in which the tracer gas is injected. In that one, in order to facilitate taking the picture, the panel here on the right side of the entrance of the tunnel was removed.

Mr. Lyon: Mark that Exhibit 2 for this deposition now.

(Whereupon the photograph referred to was marked as Plaintiff's Exhibit 2 by the Notary Public.)

[See Exhibit 29A in the Book of Exhibits.]

(Noon recess.) [37]

Defendant's Exhibit "V"—(Continued)
(Deposition of Henry Landsberg.)

Afternoon Session, 2:00 p.m., July 26, 1954.

Mr. Lyon: It is stipulated and agreed to by the counsel for both parties that this deposition was taken with full notice.

Mr. Hoegh: That all the requirements of the Federal rules as to depositions have been complied with.

Mr. Lyon: That is as to notice.

Mr. Hoegh: As to notice.

Q. Mr. Landsberg, has the tuunel now been attached to the front of the Coleman heater with the three foot secondary heat exchanger?

A. It has.

Q. Are the test points numbered on this Coleman heater with the three foot secondary heat exchanger economizer numbered the same way they are on the one with the four foot secondary heat exchanger?

A. The same way.

Q. Would you begin with point number 1, please?

A. Again we have a zero level, as you see, of 13 divisions. We are now testing point number 1. Shall we state this B.T.U.?

Q. Yes. Have you checked the B.T.U. input with the three foot secondary heat exchanger?

A. We checked it at approximately 30,000 B.T.U.

Defendant's Exhibit "V"—(Continued)
(Deposition of Henry Landsberg.)

Q. That check was done with the wet test meter the [38] same way?

A. The same way as it was tested on the first one.

Q. As soon as that settles out will you give us the reading?

A. I would call that an average of 60.

Mr. Lyon: All right, 60.

Mr. Hoegh: Q. Will you switch the sample intake—

Mr. Lyon: Let it go back to zero first.

Mr. Hoegh: (Continuing) —to point number 2, please?

Mr. Lyon: Or substantially that there. All right.

A. We are testing point number 2.

Mr. Hoegh: Q. Is that settled out enough to make a reading?

A. I think we can call that 60.

Mr' Lyon: Yes.

Mr. Hoegh: Q. Would you put the sample input on point number 3, please?

A. We are testing point number 3. I think about a 55 average there.

Mr. Lyon: All right. That is 3.

Mr. Hoegh: That is point number 3, yes. I don't believe that is marked on there.

Mr. Lyon: You better mark it 3.

Mr. Hoegh: Q. Would you mark the record, please? Switch now to number 4.

Defendant's Exhibit "V"—(Continued)
(Deposition of Henry Landsberg.)

A. We are testing number 4. I think we can call that [39] 49.

Mr. Lyon: All right.

Mr. Hoegh: Q. Would you now take samples of points 5A, B and C, beginning with point 5A, using a funnel on the end of the sample pickup tube?

A. I would say that has leveled off at 27.

Mr. Lyon: Yes.

A. Let's try 5B.

Mr. Lyon: You better label that. Oh, you have.

A. It looks like a good 22.

Mr. Hoegh: Q. That is for 5B?

A. 5B.

Mr. Lyon: You better wait, let it get to zero there so it will read on the chart here.

Mr. Hoegh: Q. Now put the sample tube at 5C, please. A. 5C. 20?

Mr. Lyon: 20 is good.

A. Let's get 2 and 3.

Mr. Hoegh: All right. A. 2.

Q. Has the sample intake been placed at point number 2 now?

A. The sample intake is on point number 2. That is what I was afraid of.

Q. This bottle is empty, too, you mean? [40]

A. We are not getting as much as we were before. Let's try on 3.

Q. Switch it over to 3, please?

A. Are you on 3 now, Earl?

Mr. Percy: Yes.

Defendant's Exhibit "V"—(Continued)

(Deposition of Henry Landsberg.)

A. I didn't both reading 2 just now because of the drastic——

Mr. Lyon: Substantially 24, wouldn't you say, what it was on the last reading?

A. All right. The concentration is way down. What we were getting before is probably what was left in there. All right. Will you read this, please? 23?

Mr. Lyon: Where did you end it?

A. Did you take it off, Earl?

Mr. Lyon: 23, I guess.

A. This test I believe should be repeated in that our concentration has changed drastically. The input is considerably less than it was before and therefore I believe that the high concentration might have been lying in here and just gradually depleted. We ought to start all over.

Mr. Hoegh: Naturally, this will stay as part of the record.

Mr. Lyon: Well, let's mark this last stack from here up to here where you are going to change as 3.

(Whereupon the portion of the graph indicated was [41] marked as Plaintiff's Exhibit 3 by the Notary Public.)

(Recess.)

Mr. Hoegh: Q. Mr. Landsberg, would you run through a calculation of the amount of solution which we are going to show by these tests for the record, please? Think out loud, perhaps it would be all right.

Defendant's Exhibit "V"—(Continued)
(Deposition of Henry Landsberg.)

A. Well, we figure the concentration in the back is an average of the sample points 1, 2, 3, and 4 in the first run, and I am using net titration levels. In other words, those readings over and above the zero level which are due to sulphur compound titration. So the average there is 60 and 57 and 60 and 11. The average reading then is 47 in the back.

Q. That is the first one?

A. On the first one. We are not figuring this test at all.

Mr. Lyon: 47 over zero?

A. 47 over the zero level which is 13 or a total of 60.

Mr. Lyon: Yes.

A. Then the readings coming out the vent, 5A, B, and C of this one were 37, 16 and 36. That is a total of—30 is close enough. So your concentration coming out is 30. Now, we showed that going in there were 7 divisions.

Mr. Hoegh: Q. By going in you mean 7 and 8?

A. Points 7 and 8, yes. So now if your air were going in there and out there without receiving any——

Q. In 7?

A. Into 7 and 8 and coming out 5A, B, and C without receiving any sulphur or air containing sulphur from the back of the furnace, the concentration coming out should be 7. So I subtract the 7 from the 30 and it is an increase of 23. 23 divided by 47——

Defendant's Exhibit "V"—(Continued)

(Deposition of Henry Landsberg.)

Q. Pardon me, the 47 there——

A. What was in the back.

Q. Is a net reading above——

A. All readings are net readings.

Q. The average figures which you use, 60, 57, 60 and 11 were all figures taken after the 13 had been subtracted?

A. Right. By definition the net titration level is the level over and above the initial zero or reference level. And all my readings are net titration levels. So you have 23 net increase in the gas coming out the vent, which divided by 47 is 50 per cent, which would indicate that the air coming out of here——

Q. The top grille?

A. The grille has been diluted or mixed with 50 per cent of its volume from air that contained the sulphur compound in the back of the furnace. [43]

Q. Would you state in terms of the amount of dilution that occurs from the air coming up the back rather than, as I remember it, you just termed it as a percentage of the air coming out the top. I mean, what we would like to have expressed is the amount of dilution which occurs due to the air going in through points 7 and 8.

A. It has been diluted. By points 7 and 8, you mean this here?

Q. Air coming up the back has been diluted air going in through 7 and 8.

A. By 50 per cent.

Defendant's Exhibit "V"—(Continued)
(Deposition of Henry Landsberg.)

Mr. Lyon: I have just got one question. Is there any other source of SO_2 going into this, any part of this instrument, other than from this bottle?

A. No. Will you ask that again, please?

Mr. Lyon: Read it to him, please.

(Question read.)

A. Well, this what?

Mr. Lyon: I will ask this question. Is there any other SO_2 going into this heater instrument other than from this SO_2 in this bottle in this setup?

A. Is there any other SO_2 entering?

Mr. Lyon: From any source.

A. Other than——

Mr. Lyon: From the bottle.

A. From the bottle. Technically, perhaps yes, in [44] that probably a trace of SO_2 is in the air in that we have air pollution, but within the ranges of what we are speaking of, no.

Mr. Lyon: Haven't you already subtracted that by the 13 reading, any air pollution?

A. No, sir. Oh, yes, that would be.

Mr. Lyon: That has been subtracted already, so that doesn't enter into this.

A. That doesn't enter into it.

Mr. Lyon: Thank you.

Mr. Hoegh: Q. Would you also make a calculation of the amount of pollution that has occurred of the air coming up through the back of the heater using only points 2 and 3 at the back of the heater?

A. Approximately 40 per cent.

Defendant's Exhibit "V"—(Continued)

(Deposition of Henry Landsberg.)

Mr. Lyon: What was that, please.

(Answer read.)

Mr. Hoegh: Q. That is taking our test of the amount of air coming out the back from points 2 and 3.

(Discussion held off record.)

Mr. Hoegh: Q. Would you restate what you told me?

A. Well, I keep getting confused as to whether we are speaking of fresh air diluting the air coming up the stack or the back, or the air behind the furnace contaminating this secondary air. As it turned out in the first case it was 50 per cent. [45]

Q. Just so we understand one another, the testimony is that of the air coming out the upper discharge grille, 50 per cent comes up the back around the lower parts and 50 per cent comes in through points 7 and 8? A. Right.

Mr. Lyon: Though you have been lately pointing to the three foot stack model, this testimony all refers to the four foot stack?

Mr. Hoegh: Yes.

A. Our tests on this are theoretical, yes.

Mr. Lyon: Are you through with this testimony?

Mr. Hoegh: Yes, that part of it.

A. Shall we start all over?

Mr. Lyon: All right.

Mr. Hoegh: Q. Let's start with point number 1 again, Mr. Landsberg. What is the heater being tested?

Defendant's Exhibit "V"—(Continued)
(Deposition of Henry Landsberg.)

A. It is a Coleman heater number 67 with the three foot heat exchanger, at point number 1.

Q. Have the fluctuations settled out so you can give a reading out, Mr. Landsberg?

A. Yes, I believe it is settled down pretty nicely at 60.

Q. Would you switch to point number 2, please?

A. We are on point number 2.

Q. Can you give a reading for point number 2 now?

A. I would say a fair average would be 60. These are [46] gross readings now.

Q. Will you switch to point number 3, please?

A. We are testing point number 3. About 59.

Mr. Lyon: That's right, 59 or 60.

Mr. Hoegh: Q. Would you switch to point number 4, please? That last reading was what?

A. 59. We are testing number 4. An average of 56?

Mr. Lyon: That is all right.

Mr. Hoegh: Q. Would you sample point 5A next, please? A. 30.

Q. That is for point 5A? A. 5A.

Q. Would you switch to 5B, please? Does that appear steady enough to take a reading? A. 26.

Q. That is for point 5B? A. Yes, 5B.

Q. Will you switch to 5C, please?

A. 26.

Q. Point 7. What is the reading for point number 7? A. 17.

Defendant's Exhibit "V"—(Continued)

(Deposition of Henry Landsberg.)

Mr. Lyon: All right, 17 or 18.

Mr. Hoegh: Make it 18.

A. All right. 8.

Q. You are now sampling from point number 8?

A. Number 8.

Mr. Lyon: It should be noted on the record that the taking of the readings of 7 and 8 are not with a funnel. The readings of 5A, B and C were with a funnel. Are you about through with this one?

Mr. Hoegh: Q. What is the reading for point number 8, please? A. Oh, 16 or 17.

Mr. Lyon: All right.

Mr. Hoegh: All right.

Mr. Percy: Do you want to use the funnel on any of these?

A. Why don't we check two or three to see how steady this is?

Mr. Hoegh: All right.

A. We are repeating the test on 2, isn't it 2?

Mr. Percy: Yes.

A. To make certain of the concentration, that it is still constant.

Mr. Hoegh: Q. Which point is this we are now checking?

A. We are taking 2. I want to check and see that the concentration, the bottle not being so full, there might be a pressure drop. It has dropped a little bit. An average of about 55. That would be 42. I guess that is good enough. We have been rushing

Defendant's Exhibit "V"—(Continued)
(Deposition of Henry Landsberg.)

things a little bit, [48] and didn't allow this to come to an equilibrium.

Mr. Hoegh: The higher figure would be conservative.

Mr. Lyon: Will you mark that number 2 on the chart? What was the last statement?

(Last portion of the record read.)

A. Using the higher figure is leaning toward the conservative side.

Mr. Hoegh: Q. Mr. Landsberg, we have constructed a shield to be placed around the main discharge grille. I would like to have you put that in position and then run checks on 5A, B and C, and 7 and 8 again.

A. Where do you want to put this?

Mr. Lyon: Mr. Hoegh, I am going to have to knock off in about five minutes.

Mr. Hoegh: I would like to make a fast check on this, Mr. Lyon.

Mr. Lyon: All right.

Mr. Hoegh: Mr. Lyon would like to leave at about 4:30. Start with 5A, 5B and 5C.

A. We have rechecked number 2.

Mr. Lyon: Well, let's mark this an exhibit up to this point and then we'll have a new one for what he is doing with the shield. That will be Exhibit 4.

(Whereupon the portion of the graph indicated was marked as Plaintiff's Exhibit 4 by the Notary Public.)

Defendant's Exhibit "V"—(Continued)

(Deposition of Henry Landsberg.)

A. In which case, if this is separate, we ought to [49] reestablish the concentration in the back.

Mr. Hoegh: Well, there is continuity here. I don't think we need to do that.

A. All right. Let's get 5A.

Q. Would you describe the hood that has been placed on the heater and the place in which it has been put, Mr. Landsberg?

A. There is a hood above—what do you call the outlet?

Q. Main discharge grille.

A. Main discharge from the furnace extending five inches outward and on the sides only five inches downward.

Q. It is in the form of an inverted U?

A. It is in the form of an inverted U, wide base.

Q. Will you take a reading at point 5A, please?

A. 28.

Q. Will you now check 5B, please? Would you mark point 5B, please? A. 24.

Q. Check 5C, please. A. 26.

Q. Now, put the sample input at points 7 and 8.

A. Wait a minute, Earl, take it away. Let's a good zero level here because we are getting down to very low concentration.

Q. While we are waiting, this can go on the record, [50] did you have an opportunity to examine those pictures, Mr. Lyon?

Mr. Lyon: No, I will. What do you want about those?

Defendant's Exhibit "V"—(Continued)
(Deposition of Henry Landsberg.)

Mr. Hoegh: Just I would like to introduce them as representing——

Mr. Lyon: All right. You go ahead and introduce them. Let's do it tomorrow. Let's get through here. I really have got to leave.

A. 15?

Mr. Lyon: I guess it is all right.

Mr. Hoegh: Switch to point number 8, please.

Mr. Lyon: Draw a line there. Switch it. That's it.

Mr. Hoegh: Q. Is that steady enough to take a reading now, Mr. Landsberg?

A. 14, a little over. I guess 15 is closer.

Mr. Lyon: Yes, 15 is all right.

Mr. Hoegh: All right. What are your plans?

Mr. Lyon: Well, we will be back here in the morning at 10:00 o'clock. You can finish your direct on this, whatever you feel like.

Mr. Hoegh: We would like to go early and get going.

Mr. Lyon: That is nigh on impossible, Jack.

Mr. Hoegh: What are your commitments tomorrow? It is not so much tomorrow but just a lot to do before you go. [51]

A. How much time do you think we will have to spend?

Mr. Lyon: We will have all day, I am pretty sure.

Mr. Hoegh: On that basis it won't make any difference whether it is 9:00 or 10:00.

(Discussion held off record.)

Defendant's Exhibit "V"—(Continued)

(Deposition of Henry Landsberg.)

Mr. Lyon: You better mark this last piece.

Mr. Hoegh: We can turn this thing off.

Mr. Lyon: You just bring us the chart tomorrow, that is all we will want. Oh, yes, we want to get in and examine the back of this thing tomorrow, both of them.

(Discussion held off record.)

Mr. Lyon: This last one should be marked Exhibit 5.

(Whereupon the last portion of the graph was marked as Plaintiff's Exhibit 5 by the Notary Public.)

(Whereupon the deposition was adjourned to resume at 10:00 o'clock on July 27th, 1954.)

July 27, 1954, 10:00 a.m.

Mr. Hoegh: We can start taking the back off of this one.

Cross Examination

Q. (By Mr. Lyon): Before you take it apart, do you know who constructed these models?

A. Holly.

Q. Do you know why they were constructed the way they were?

A. I presume to make these tests.

Q. You didn't have anything to do with it?

A. No, other than devising the means of introducing the sulphur from that tunnel.

Q. Was it your idea where to take these tests from?

Defendant's Exhibit "V"—(Continued)
(Deposition of Henry Landsberg.)

Mr. Hoegh: How do you mean that?

Mr. Lyon: Q. Were you instructed by any person where you were to make these tests from?

A. Well, there was a general discussion as to what we were after, and I imagine you could say that we more or less decided where the samples which would indicate what we were looking for should be taken.

Q. It was part of your judgment where these samples should be taken and how they should be taken?
A. Yes. [53]

Q. Now, I call your attention to the heater on the inside here, this glass panel, this is the Coleman old style economizer furnace with the four foot stack, is it not?
A. Right.

Q. Now, how far are the vertical ribs running up the back of this furnace from this glass?

A. You mean how far up?

Q. Now, how far from the glass are they here?

A. Still I don't quite understand.

Q. How far is this rib from this pane of glass at the bottom, I am asking?
A. I can't see.

Q. You can't tell?

Mr. Hoegh: Do they appear to be touching? Is that what you are interested in?

Mr. Lyon: Q. Yes, is it touching down there?

A. It is quite close. It would appear to be touching, yes.

Q. How about it up at the top?

Defendant's Exhibit "V"—(Continued)

(Deposition of Henry Landsberg.)

A. I think it is perhaps a little farther in, that is, not touching.

Q. About how far would you say it was in?

A. Perhaps a quarter of an inch.

Q. And it is touching at the bottom?

A. Yes. [54]

Q. Why was the furnace in this model, if you know, tilted over at that angle?

A. I don't know.

Q. You don't know?

Mr. Hoegh: I would like to correct the—direct the witness' attention to this plate here, the bottom of the secondary heat exchanger, and ask him whether or not that is touching the glass?

A. As near as I can see, it is.

Mr. Hoegh: Will you also notice that extending down through the header plate is what we termed a male connection with the flue? A. Yes.

Mr. Hoegh: And what extends into that male connection? It would be a female extension?

A. Yes, it would be a female extension. The male extends to that. I presume this is part of the furnace here.

Mr. Hoegh: And would that male extension which extends into the female extension of the flue position the top of the lower box?

A. Yes, I believe it would.

Mr. Lyon: Q. Now, I call your attention to the fact that this entire box, the top corner of it, is

Defendant's Exhibit "V"—(Continued)

(Deposition of Henry Landsberg.)

approximately a half inch in from this header member, is it not? A. Yes. [55]

Q. Down at the bottom it is almost out, as close to it as you can get it out; the only space is the width of this flange. A. Yes.

Q. All right. You can take it apart any time you want.

Mr. Hoegh: I think we have established that this location of the top of this box is due to the construction of the box itself and has nothing to do with the construction of the whole——

Mr. Lyon: I don't know what has been established. That is to be seen.

Mr. Hoegh: All right. Do you want to take the back off of it?

Mr. Lyon: Q. By the way, before doing that, Mr. Witness, when you made tests on these two machines, did you in any way check to determine the B.T.U. content of the gas being used?

A. No.

Q. Thank you. Mr. Landsberg, why did you choose points 1, 2, 3 and 4 as the points for your test?

A. We believe that at that point or in the vicinity of those points, rather, the gas, the samples would be representative of the gas or air in that area or moving up this stack.

Q. Why not, say, half way down? [56]

A. Half way down probably would have been just as good. However, the farther up the more

Defendant's Exhibit "V"—(Continued)

(Deposition of Henry Landsberg.)

homogeneous the sample is we would probably get.

Q. What do you mean by homogeneous sample?

A. Thoroughly mixed.

Q. Thoroughly mixed.

A. With sulphur, constant readings.

Q. Then it is not necessarily true that the gases are thoroughly mixed up here, is it?

A. If you will notice, when we were recording with the Titrilog, the line was waving back and forth to a degree. Perhaps a little farther down it would move a little more.

Q. Actually, there was about on every reading, there was about a 15 per cent error, wasn't there?

A. Not a 15 per cent error. There was a 15 per cent variation. I wouldn't say necessarily 15 per cent. I know there was some variation and we averaged those readings.

Q. Yes. Do you believe that that accuracy of those readings in any way can be compared with your earlier testimony that this instrument was accurate to whatever reading you gave, what per cent?

A. What you are speaking of is not accuracy.

Q. I just want to be sure. Does that not affect the accuracy of the instrument?

A. The accuracy of the instrument is in no way affected by the type of sample or sampling that we do. [57]

Q. You mean you can just grab a sample anywhere and the reading of that instrument is going

Defendant's Exhibit "V"—(Continued)
(Deposition of Henry Landsberg.)

to be accurate to I think you said 100 to 1 per cent or 10 to 1 per cent or something like that?

A. I never said any figures approaching what you just mentioned.

Q. All right. A. You are confusing——

Q. What is the accuracy?

A. You are confusing accuracy and sensitivity. The sensitivity of the Titri-log, a threshold sensitivity is somewhere in the order of one part in ten million, meaning that we could see that small an amount. The accuracy of the instrument is determined by calibration. The accuracy of the instrument can be made, naturally, within certain limits as accurate as you like by the frequency of the calibrations. We have established that by calibrating the instrument, oh, in the order of once every 24 hours the accuracy would be in the order of 3 per cent, 3 or 4 per cent, I don't recall the exact figures.

Q. By that you mean——

A. By that I mean is that the reading that we established and the concentration we would establish would be within 3 per cent of the absolute value of that which was present.

Q. Then if the instrument—your statement still [58] stands when the instrument shows a variation it is from time to time—pardon me, let me finish my question—of the same reading at the same point at 55, and the next time you take that point it is 60, that that accuracy is still within 3 per cent?

Defendant's Exhibit "V"—(Continued)

(Deposition of Henry Landsberg.)

A. Again, that is not the accuracy of the instrument. We were introducing sulphur dioxide into the tunnel and the amount or the diffusion of the sulphur dioxide through the tunnel into the furnace and the further diffusion of the sulphur dioxide in the air that was behind this furnace might be varying somewhat, and that is the reason we took a test over a period of time and averaged the readings.

Q. Then you had, as I remember the figures yesterday, we had a normal of 13 reading, didn't we?

A. That is our zero level.

Q. Yes. And at one time you gave a reading at point number 2 or number 3 of the model which gave a 60 reading, didn't you?

A. Right. Well, as I said, I figured roughly——

Q. Have you those figures?

A. I have those, yes. Which test are you referring to? Either one would be the same.

Q. The last test that was run on this three foot stack.

A. Yes, I had a net of 47 which would be a gross [59] figure of 60.

Q. Later you took a reading at point 2 which gave you a reading of 55 or a net difference from zero of——

A. Of 42. Those are reversed. You said it was 60 at 2 and 55 or 56 or 59.

Q. 55 it was the second time you took it here as I can show you on the chart here.

Defendant's Exhibit "V"—(Continued)
(Deposition of Henry Landsberg.)

A. 55 was at point 4.

Q. No. The reading which you may read on point 2 shown on Exhibit 5 here. I call your attention to it.

A. Oh, I didn't know which reading. I see what you mean.

Q. That one read 55.

A. Both points read that.

Q. That was 55. Now, at point 2 earlier on the same run it was at 60, was it not?

A. Right.

Q. Now, that reduces—by reducing that to zero you come out with 42 and 47? A. Right.

Q. Which automatically makes a difference of around between 11 and 12 per cent, does it not, between the readings? A. Yes, it does.

Q. Then the readings of your instrument could vary on that one test alone 12 per cent, could it not?

A. You say—would you repeat that, please?

Q. I say the readings of your instrument alone at that one point for those two tests varied in the order of 12 per cent, did it not?

A. The readings of the instrument at that point at two different tests varied that much.

Q. All right. Now, I noticed yesterday that when you took some tests you just used the open end of a copper tubing, did you not?

A. Right.

Defendant's Exhibit "V"—(Continued)

(Deposition of Henry Landsberg.)

Q. And at other times you took tests with a funnel over that. A. Right.

Q. Now, would not the funnel concentrate and prevent outside air from mixing with the sample more than without the funnel?

A. No. Where we did not use the funnel it was intended to take the air only as it was going in and not obstruct the passage of the air. When we used the funnel up at the points 5A, B and C, we were attempting to get as large a cross-section of sample as possible, and that was outgoing air.

Q. Wouldn't that tend to concentrate the sample?

A. That would definitely not tend to concentrate the sample.

Q. In other words, you have have no contamination of the sample, no greater contamination of the sample with [61] the tubing alone and the small hole picking out all the atmosphere in this room and where you concentrated it with a funnel?

A. No, sir.

Q. Why did you use the funnel up there?

A. To get a larger cross-section of air that was coming out of the point.

Q. Actually you shut out the outside air from going into this thing, didn't you?

A. It is possible we did that, too, because the air there we were interested in was not out here in front of the flue or the—what do you call that

Defendant's Exhibit "V"—(Continued)
(Deposition of Henry Landsberg.)

—the grille, but immediately as it was coming out of the grille.

Q. If you wanted a true sample of the air in that upper stack to compare with any other sample, shouldn't you have stuck the tubing inside the stack like you did in your other samples?

A. We could very easily have done so but then we would have specifically three points, 5A, B, and C covering a very narrow area.

Q. Isn't that what the other tests covered, just a very narrow area?

A. We probed with the other test there in that this was considered only. We were interested in the air going in in this area above it, not coming out.

Q. Wasn't the tests on points 1, 2, 3 and 4 merely [62] taken through an eighth inch opening?

A. We have four points there.

Q. You had three up here in a much smaller area.

A. We would be very happy to put the funnel on here. We would have to have had to enlarge the holes and so change the flow conditions on the furnace. We were trying to disrupt normal flow conditions as little as possible.

Mr. Hoegh: Would you think about that a moment?

Mr. Lyon: Q. Did your sampling disturb the natural flow?

Defendant's Exhibit "V"—(Continued)

(Deposition of Henry Landsberg.)

A. I don't believe so. We kept our volumes and openings in construction practically to nil.

Q. The volume of air that passes through between this, the glass, and the back of this furnace, was what?

A. I don't know the volume that passes up through the back there. I would say the thousand cc sample we took from there was a mere fraction of the total.

Q. Do you know the pressure that is in there?

A. I imagine it was very close to atmospheric pressure.

Q. How much above atmospheric would it be?

A. I really don't know whether it is above or below, it is very close.

Q. Would any gas rise in there if it was below atmospheric pressure? If it was at atmospheric pressure, would any gas flow in there? [63]

A. Radiation would make it flow.

Q. A very minute flow of radiation?

A. Yes.

Q. It is a difference in temperature, isn't it? It was a difference in temperature that causes the flow?

Mr. Hoegh: By that you mean the difference in temperature which causes a difference in pressure, Mr. Lyon?

Mr. Lyon: Well, between this portion of this and this portion, It causes——

A. The flow is caused by the difference in tem-

Defendant's Exhibit "V"—(Continued)
(Deposition of Henry Landsberg.)

perature over the entire stack, and you have the sensitometer effect.

Q. Did you at any time correlate your tests to determine any of the temperatures?

A. No, we established that merely by the B.T.U. input to the furnace.

Q. Do you have any idea what the temperature at point 2 is? A. No.

Q. That is, during these tests? A. No.

Q. Or what the temperature was at the bottom of the furnace? A. No.

Q. Now, were either of these models operated under the conditions that they would operate in the wall where they were used for heating purposes? [64]

A. Well, I presume these models are supposed to simulate that condition.

Q. Well, I am asking you, you made the tests and you are trying to testify. As I believe, you tried to prove something. Now, were these models at the time these tests were made in the operating condition that these furnaces were manufactured for? A. I would say very closely.

Q. How about that big box in the front end? Do you use any such thing as that when you are heating a house?

A. No, but we figure it doesn't create any abnormal condition in that volume there is more than ample to what the furnace normally draws.

Q. To lock this furnace off in this direction

Defendant's Exhibit "V"—(Continued)

(Deposition of Henry Landsberg.)

Q. Here, wouldn't you heat the air in this box at all times?

A. I would say perhaps you warmed it up some.

Q. And in these furnaces, I don't know whether you are familiar with it or not, aren't these furnaces run under a very close tolerance as to the heats that they can build up inside of them?

A. I am not familiar with that.

Q. You are not. But this box would increase the entire heat in all the furnace, would it not?

A. Due to the volume involved in this box which is quite large, I would say very little. [65]

Q. You didn't make any test to find out, though, did you? A. No.

Q. Did you check temperatures on these exhibits in any place? A. No.

Mr. Lyon: Have you got the back off that?

Mr. Hoegh: Yes. Mr. Landsberg, would you measure the distance between the stud facing in this test setup on the wall heater with the four foot heat exchanger at the top and at the bottom?

A. This distance here?

Mr. Hoegh: Yes, between the two studs.

A. Three quarters of an inch.

Mr. Hoegh: No, I am sorry, from one stud over to the other stud.

A. Oh, I see. Fourteen and a half inches.

Mr. Hoegh: That is at about three inches below the top of the lower box?

Defendant's Exhibit "V"—(Continued)
(Deposition of Henry Landsberg.)

A. About three inches below the top of the lower box.

Mr. Hoegh: Would you also measure it at the bottom? A. Fourteen and a half inches.

Mr. Lyon: What was the last?

(Answer read.)

Mr. Lyon: Fourteen and three eighths, is it not?

A. Yes. [66]

Mr. Hoegh: Would you measure——

Mr. Lyon: Wait a minute. Could I have the answer to what the problem was?

A. Fourteen and a half.

Mr. Hoegh: Would you measure the width of the studding itself, please?

A. Four and a quarter.

Mr. Hoegh: You have got it hooked on the wrong thing. A. Three and a half.

Mr. Hoegh: Would you measure, please, the distance from the header plate of the secondary heat exchanger to the base upon which the lower back rests?

A. All the way down to the base?

Mr. Hoegh: I believe the width of the scale is two inches.

A. Two inches. Put it back, please.

Mr. Lyon: Is that where you want it measured?

Mr. Hoegh: Yes.

A. Fifty-eight and three quarters.

Mr. Hoegh: I guess we are ready to take off the back now, unless you have further questions.

Defendant's Exhibit "V"—(Continued)

(Deposition of Henry Landsberg.)

Mr. Lyon: Q. Well, I notice at the top of this four foot Economizer model there is a sheet metal angle that goes up and engages in the Economizer. Is that straight or bent outwardly?

A. The top is bent downward just a little bit.

Q. Does that force the top of the whole box in away from what was the glass partition?

A. You mean this portion here?

Q. Yes.

A. Yes, it would a little bit.

Q. If that was straightened, the back of the lower back would have been against the glass partition all the way, would it?

A. It would be closer.

Mr. Lyon: You can take the back off.

Mr. Hoegh. All right.

Mr. Lyon: Q. Did you ever during this test make any measurements of the amount of SO₂ you were putting in this machine?

A. Amount of SO₂? You mean amount or concentration?

Q. Amount. A. No.

Q. Will not the concentration of SO₂ and air vary according to the temperatures and pressures on it? A. No.

Q. Does not the concentration of SO₂ when mixed with another gas vary when the gas is expanded by the addition of air?

A. I don't believe I can answer that question. I still don't understand.

Defendant's Exhibit "V"—(Continued)
(Deposition of Henry Landsberg.)

Q. Did you make any attempt to be sure that during [68] your test the samples you drew were under the same pressures and temperatures?

A. A gas such as SO_2 in air, if that mixture is taken and heated or compressed the concentration will remain constant.

Q. But the amount of SO_2 that you permitted to go in from the box out here is going to alter the concentration?

A. The amount that is injected from the SO_2 bottle will determine the concentration.

Q. Now, you made tests at points 1, 2, 3, 4, all of these places; did you measure the amount that was being put into the machine during those tests?

A. I was only interested in concentrations, not amounts.

Q. Wouldn't the concentration vary as that amount being injected into the machine is varied?

A. Which machine?

Q. The entire setup that you had here.

A. I think I better hear that again.

Mr. Lyon: Read it again.

(Pending question read.)

A. Wouldn't the concentration vary as the amount being injected into the machine—we were not, injecting the SO_2 from the bottle or——

Mr. Lyon: Q. I am talking about the whole setup. [69] That isn't the furnace. You have got the box.

Defendant's Exhibit "V"—(Continued)

(Deposition of Henry Landsberg.)

A. The concentration would vary as the amount that is being injected in from the bottle.

Q. And, in fact, at times that concentration at the same two points varied as much as 12 per cent, didn't it, during the tests you made?

A. At different times.

Q. How do you know you weren't at the bottom limits of concentration at the points 5A, B and C and at the top limits at 1, 2, 3, and 4, when the tests were made?

A. I do not know that for sure, except the time interval was short and also in the calculations, I doubt if it would have any appreciable difference, the percentage would not carry though.

Q. Well, if you take the percentage at the bottom that you found here and the top up there, it varies over 50 per cent, doesn't it, by your own figures?

A. The concentration here and the concentration up at the top?

Q. Yes.

A. Were different by some—

Q. The final statement of what the per cent that went from here, from the bottom end into the top end of SO₂ would vary as much as 50 per cent, from your own calculations, wouldn't they?

Mr. Hoegh: Did you say varied from—I don't understand [70] the question, counsel.

Mr. Lyon: Q. If you take the top limits up there or here and bottom limits up there that you

Defendant's Exhibit "V"—(Continued)
(Deposition of Henry Landsberg.)

got in your calculations, against the bottom limits here and the top limits up above, you got a variation of over 50 per cent? A. No, sir.

Q. Well, will you calculate those two for me then? Show me why you didn't.

A. All right. Now, what is it you would like me to calculate?

Q. All right. You show me how you calculated any air that went from the back of that thing into the upper heat exchanger. You go through the calculations all the way that you testified to yesterday.

Mr. Hoegh: If you want to limit it to that, yes, we will go ahead, Mr. Landsberg.

A. Go through the formulation or just the calculations?

Mr. Lyon: This is cross examination. He testified that there was some air went there from up there and he tried to give us a volume by this. I want him to show us the exact figures that he did with that. A. Okeh.

Q. How did you do it? Figure it out again. I don't want it from the one you used yesterday.

A. This isn't the one I used. I want to establish the formula by which we do it. [71]

Q. All right.

A. We will call V the volume coming out of the top grille.

Q. How did you determine that volume?

A. I am calling it V. There is no quantity.

Defendant's Exhibit "V"—(Continued)

(Deposition of Henry Landsberg.)

Q. No quantity?

A. Y is the gas entering through 7 and 8 there.

Q. All right. Is there any quantity or volume figured there? A. No quantity.

Q. And no volume?

A. No volume. X is the gas which finds its way from the lower portion of the back furnace into the upper portion and out this upper grille.

Q. Now, how do you know there is any such thing?

A. It can come out zero, if there isn't.

Q. How do you know that? How do you determine that factor, it will come out zero or come out 100?

A. That is what I am going to show.

Q. All right.

A. Therefore, V is equal to Y plus X. Now, we know V will be Y going in.

Q. How do we know that formula, what did you—where did you assume that V has a relation to Y and X? How did you establish that?

A. There is air coming out at the upper grille V. [72] Where else could it come from?

Q. All right. That is my question. How did you assume that any air coming out of there came from any place? You haven't determined that. You are making an assumption that the air coming out of there is the combination run of air entering here and air coming up the back of this machine.

A. That is an assumption I made when I saw

Defendant's Exhibit "V"—(Continued)

(Deposition of Henry Landsberg.)

a sketch of the furnace and I could see no other place where any appreciable or if any air could come from, that is, if it is coming out, it has got to go in somewhere.

Q. That was an assumption. Now, you can go ahead. That is the assumption upon which you based the formula V equals Y plus X.

A. Right. Now then, we tested these spots here.

Q. How did you test those?

A. This is with the Titrilog, these readings that we have gotten.

Q. All right. Explain it. The court didn't see this. I want it stated.

A. These points have been—the points 1, 2, 3, and 4 were tested with the Titrilog and they resulted in readings. Those readings, if you like, can be computed into any figure you like such as grams or milligrams or parts per million. However, I think it can be proven that the reading itself is sufficient since it is all a relative [73] type of calculation. So we will take that reading as a unit, we will just use units.

Q. That is no test in volume, though, is it?

A. No volume. This is strictly the reaction on the Titrilog.

Q. That is no measure of the velocity of any air in there?

A. No, this is a reading.

Q. The Titrilog doesn't even show you that there is any air passing through there of velocity, does it?

A. No.

Defendant's Exhibit "V"—(Continued)

(Deposition of Henry Landsberg.)

Q. Or the volume of it?

A. No. All right. So we have established the relative concentration of points 1, 2, 3 and 4.

Q. Concentration of what? Now, let's get it.

A. Concentration of sulphur dioxide.

Q. In what?

A. In the air moving behind the furnace.

Q. You mean in the air?

A. Behind the furnace.

Q. That's right. But not moving, you didn't establish it was moving?

A. I saw it was moving once when titanium tetrachloride was injected.

Q. All right.

A. All right. Then we tested points 5A, B and C [74] which is at volume V and established the relative concentrations there. Then we established that at points 7 and 8, which is my volume Y entering the upper heat exchanger. We established the concentration of the gas, the sulphur dioxide concentration or relative sulphur dioxide concentration of the air that is going into that grille. Therefore, and the readings were at the average readings at V.

Q. Take them on the second machine, will you, please?

A. At V the concentration or relative concentration was 13.

Q. At V. Now, where was point V?

A. V, outlet of the grille.

Q. That is the point 5A, B and C.

Defendant's Exhibit "V"—(Continued)
(Deposition of Henry Landsberg.)

A. Right, the average.

Q. That was the average that you got?

A. Yes.

Q. And that was what?

A. Which reading, set of readings would you like, before or after we put the hood over there?

Q. Before.

A. Okeh. That was 14. That concentration times the volume V would be the amount of sulphur——

Q. But you don't know what V is?

A. I don't know what V is. I don't care. That is equal to the amount of sulphur that is going in with Y, which [75] would be four times Y.

Q. Where is Y?

A. Y is the air, gas or air going in points 7 and 8.

Q. All right.

A. Plus the sulphur concentration, relative concentration at points 1, 2, 3 and 4.

Q. Why isn't it 17 instead of 4? Why isn't it 17?

A. It didn't test out to be 17.

Q. Oh, that's right. Pardon me.

A. Plus the concentration at 1, 2, 3 and 4, times the volume X, which I also do not know. And that was 46. Therefore, the amount of sulphur moving up there is 46 times X. Solving these two equations simultaneously would give me 10 V equals 42 X.

Q. In other words, your statement then is that

Defendant's Exhibit "V"—(Continued)

(Deposition of Henry Landsberg.)

the volume up here is one quarter of the volume down here?

A. I haven't stated any figure yet.

Q. Oh, all right. Go ahead.

A. The volume X, moving up behind the furnace into volume V which is coming out the upper grille, is 24 per cent of——

Q. If there is any such motion.

A. I am not—I am saying it is by my figures and my tests.

Q. Now, will you calculate that? Make the same calculations, knocking five points off as you did at points 1, [76] 2, 3 and 4.

A. All right. Knocking five points off 1, 2, 3, and 4?

Q. Of your average at points 1, 2, 3, and 4.

A. You want me to go through the whole works?

Q. That would be 41 for your average, would it not, instead of 46?

A. 41. It would be 10/37ths. That would be 27 per cent.

Q. That would be 27 per cent. And that is a difference of three points in eight, is it not, or three points in nine per cent?

Mr. Hoegh: One point in nine.

Mr. Lyon: Q. That is a difference of approximately $12\frac{1}{2}$ per cent, isn't it, between the two readings?

A. That is a difference of $12\frac{1}{2}$ per cent of the per cent.

Defendant's Exhibit "V"—(Continued)
(Deposition of Henry Landsberg.)

Q. That's right. In other words, your machine gave you a reading $12\frac{1}{2}$ per cent apart, did it not?

A. The final result was 12 per cent or $12\frac{1}{2}$ per cent of the per cent difference different.

Q. I mean you calculated the volume up there and the per cent of that volume? A. Yes.

Q. Now, you have calculated it on two sets given you by the machine. [77] A. Yes.

Q. Isn't there a 12 per cent difference in that answer? A. I will say——

Q. In that answer.

A. One result was 24 per cent. The other result was 27 per cent. The difference between the two is 12 per cent of the per cent.

Q. That's right. Now, you didn't make any further tests to determine whether or not the volume up at the top had decreased, did you, when you made that second run in the back?

A. I didn't check any volumes.

Q. You didn't check every time you checked up here, you didn't check at 5A, B and C, you didn't check it at 7 and 8 simultaneously, and you didn't check back 1, 2, 3 and 4 to see that your readings were constant, did you?

A. None of the readings were taken simultaneously, but all of the readings were taken over a very short period and all the readings were taken over a time to indicate that concentrations were remaining relatively constant, and if you will note

Defendant's Exhibit "V"—(Continued)

(Deposition of Henry Landsberg.)

that I immediately caught it when this thing changed here by a recheck on this furnace.

Q. Did you not make your readings in a line one after the other and yet immediately after finishing up at 5A, B, and C, you went down again to 2 and discovered that some [78] place you had a five point difference?

A. I wasn't worried about a five point difference. I was worried about drastic differences.

Q. Isn't a 12 per cent difference in an answer quite an unscientific approach to anything?

A. Not necessarily so at all. It depends on what you are doing, the manner in which you are doing it.

Q. You might have had a 12 per cent difference up there the second time you measured it, couldn't you? You didn't bother to test it?

A. I can't answer that because I never had a 12 per cent difference in a reading.

Q. Was there any attempt made to keep your volumes constant?

A. Volume of the—which volume?

Q. The volume of airs flowing through, through this machine, we call the whole works.

A. Attempts were made in keeping the volumes constant by operating the furnace at normal B.T.U. rating, assuming under those conditions that——

Q. You don't know what the B.T.U. rating is, do you?

A. I have heard that these are normally operated at 36,000 B.T.U.'s.

Defendant's Exhibit "V"—(Continued)
(Deposition of Henry Landsberg.)

Mr. Lyon: I will move that that answer be stricken.

Q. Do you know of your own knowledge under what conditions these were running yesterday? [79]

A. No, I don't know what they are rated at. I think they were running at 30,000 B.T.U.'s.

Q. How do you know that?

A. I know the volume of gas being introduced into the furnace. I know the type of gas that is being introduced into the furnace, and I know very closely the approximate B.T.U. content of that gas.

Q. Isn't it a fact that the B.T.U. content of that gas could vary as much as 10 or 15 per cent?

A. Not 10 or 15 per cent, no, sir.

Q. You didn't bother to check the B.T.U. content?

A. No, I didn't check the B.T.U. because it is El Paso natural gas and I know how closely they check the B.T.U. content, and this is the gas that we are using.

Q. How much would it change in changed temperature? A. The gas——

Q. The B.T.U. content of that gas.

A. Over what? How much change in temperature?

Q. Well, any change.

A. It would change as the volume of the gas would change.

Q. That's right. And the temperature changes would change the B.T.U. content, wouldn't it?

Defendant's Exhibit "V"—(Continued)

(Deposition of Henry Landsberg.)

A. Right.

Q. Now, at what temperatures were you—do you say that you have personal knowledge these B.T.U. ratings [80] were made?

A. They are generally made, I think, at standard conditions which is——

Q. I mean that you have done yourself. I don't want anything somebody told you, only what you saw done or did.

A. I haven't checked the B.T.U. content of this gas.

Q. Then how can you state other than from what somebody else told you that this machine was operating at 30,000 B.T.U.?

A. Well, I will state this way, that I know I measured the quantity of gas being introduced into this machine, I also know that it is natural gas that is being introduced. I will leave it at that.

Q. Isn't it a fact in testing these machines for approval by the A.G.A. they require you to make a test of the B.T.U. units of the gas that is being put into them?

A. That is true, but these machines are used all over the country, and all over the country the B.T.U. content of gas, which might be either natural or manufactured or mixtures of those, will vary drastically.

Q. That's right. And they will not accept the gas company's statement that it is such and such B.T.U. rating, will they?

Defendant's Exhibit "V"—(Continued)
(Deposition of Henry Landsberg.)

A. Who will not accept?

Mr. Hoegh: I will object to that. [81]

Mr. Lyon: In making such a test to determine——

Mr. Hoegh: I will object to that, counsel. This man isn't familiar with A.G.A. procedure.

Mr. Lyon: Q. Why wasn't this machine, even assuming that your figure of 30,000 B.T.U.'s is correct, why wasn't this machine operated at its normal rate of 35,000? A. I don't know.

Q. For the purpose of this test.

A. Other than the fact it is my understanding that it was operated at a lower B.T.U. content so that our answers would be conservative in that a higher B.T.U. content, the air intake would be greater.

Q. How do you know that? What air intake?

A. Into the furnace.

Q. How do you know that that would vary where the gas went?

A. I don't know for sure.

Mr. Hoegh: For the benefit of counsel, I can establish why we operated that heater——

Mr. Lyon: I just want this man's testimony. If you have got another witness——

Mr. Hoegh: You are entitled to that.

Mr. Lyon: Q. Now, did you make any correlation between the concentration of the SO₂ anywhere in this machine and the volume or velocity of the gases going [82] through?

Defendant's Exhibit "V"—(Continued)

(Deposition of Henry Landsberg.)

A. I didn't follow that.

Mr. Lyon: Read it.

(Question read.)

A. Going through what?

Q. The machine.

A. Correlation of it?

Q. Through the heater.

A. I don't know if I quite understand it, but I think the answer is no.

Mr. Hoegh: I would like to call to your attention, counsel, that we did have testimony yesterday that velocity checks were made on the output of the secondary heat exchanger.

Mr. Lyon: Q. Now, could you get a greater concentration of gas in the furnace than you put into it?

A. How could we get a concentration, you are speaking of sulphur dioxide?

Q. That's right.

A. How could we get a greater concentration of sulphur dioxide?

Q. At any point in the furnace.

A. Than what was put into it?

Q. Yes. A. I don't know of any.

Q. Well, I will call your attention to the fact that [83] at point number 11 in the first test, you check these figures, please, if you have them, or get them off the exhibit.

A. Point number 11, where is that?

Q. That was the hole in the box there.

Defendant's Exhibit "V"—(Continued)
(Deposition of Henry Landsberg.)

A. Yes.

Q. That was taken at the, I believe you said that that was the intake to the furnace?

A. Yes.

Q. Now, wouldn't that be as great a concentration as you could ever have of SO_2 in the furnace?

A. If it is not mixed with air coming from elsewhere.

Q. That's right. If it was mixed with air it would be less, wouldn't it?

A. It would be less, yes. It wouldn't be any more.

Q. Will you try to explain to me how the reading at point 11 during these tests you made yesterday was 60? In other words, 47 above normal, and yet at the points 1, 2, 3 and 4 the reading was 70 and 73 or 60, 57 to 60 above normal.

A. Considerable, not considerable but some time had elapsed between the two tests and evidently our tank was going dry because shortly after we started, we moved over and started the next test, it completely depleted.

Q. Wasn't it possible that that concentration was varying all the time during that test? [84]

A. It is possible that the concentration was varying somewhat during the test. In fact, it was in—that is the reason we never established a completely straight line on the record, but took average readings, and the difference between the two—between the highest and the lowest were in the order of,

Defendant's Exhibit "V"—(Continued)

(Deposition of Henry Landsberg.)

oh, it varied quite drastically, but I would say a maximum of 10 per cent.

Q. Now, your first tests of points 1, 2, 3, and 4, these were run almost at the same time, weren't they? A. Very closely, yes.

Q. Very closely. And I call your attention to the fact at point 1 and 3 the readings of the machine was 73, was it not?

A. Points 1 and 3, yes.

Q. And at point 2 it was 70, was it not?

A. Right.

Q. Now, at point 4, what was it?

A. 11, or 24.

Q. 24. That's correct. Now, will you please explain the discrepancy there?

A. Very possibly or very probably a channeling of the gas. That is again the reason we have taken a cross-section there, in order to get an average.

Q. Isn't it a fact that if the concentration goes up at any point in this machine above what went into it at the opening, it would have to be because there was a [85] stagnation point and the SO₂ was staying there? A. The SO₂?

Q. Because of its weight rather than passing out with the lighter air.

Mr. Hoegh: Counsel, I would like to have you keep your hypothetical question to facts. I don't believe there has been any testimony that there was stagnation.

Defendant's Exhibit "V"—(Continued)
(Deposition of Henry Landsberg.)

Mr. Lyon: I believe there was here.

Mr. Hoegh: Or that there was a higher concentration at the back than in the front a particular instant.

Mr. Lyon: I claim the tests show that there was no flow in there at all.

Q. Now, isn't that the only way you could get that higher reading?

A. I have lost you. Higher reading where?

Q. That you could get a higher concentration any place in the furnace than at the input would be because there was no flow.

A. I have not——

Q. No concentration.

A. I have not stated that.

Q. I didn't say you stated that. I said isn't it a fact that that is the only way you could get such a reading? A. No, sir.

Q. How other did you get it? [86]

A. I believe you can get it that way because the SO_2 , even though the higher gravity, if it will do anything it will fall down, and the concentration that we were putting in, I don't believe gravity would enter into it in that we are only injecting in seven parts per million.

Q. All right. At the point under the burner here, what was the reading you got there of concentration when you took it under the burner?

A. Under the burner, as I recall the reading, it

Defendant's Exhibit "V"—(Continued)

(Deposition of Henry Landsberg.)

was quite low, but again—well, it was quite low. It was on the outer edge and it was very conceivable that the gas is flowing right by it and channeling and leaving a void space, not a void space but a dead air space there.

Mr. Hoegh: I didn't get that.

Mr. Lyon: Q. What was the purpose of the mixer then if air was going to be in this furnace?

Mr. Hoegh: Pardon me, counsel. I didn't hear the last answer.

(Last answer read.)

A. The purpose of the mixer was to mix the air before it entered the furnace.

Mr. Lyon: Q. Mix the air with what? Go ahead.

A. To thoroughly mix the air with the SO_2 as it entered the furnace.

Q. Is there anything in here that could have separated that mixture in these furnaces after it was mixed? [87] A. No.

Q. Then how can you get a channeling of that mixture?

A. Very possibly the air was lying in there and just stayed in there or is coming from the back.

Q. Oh, wait a minute. Then it was possible for air to be admitted from the back of this furnace during this test, too?

A. I presume some air, yes.

Q. Was there sufficient to make this quite sizeable drop in concentration?

Defendant's Exhibit "V"—(Continued)
(Deposition of Henry Landsberg.)

A. No, no. Well, that is the reason we tested further up on the stack, so that if air did come from other sources the mixture would be homogeneous at the point that we analyzed.

Q. Would you show me on the model over here were there was any place for the air to get in the back of it?

A. Let's see, the glass was all the way down to here. Well, from the looks of things I don't believe air could have gotten in through the back. But this air, when the tests were started was present and it could very well have remained there.

Q. Did you make any test to determine whether or not there was a homogeneous mixture of this sulphur and this air?

A. Our record will indicate how homogeneous the mixture was, the degree of fluctuation of the record as it [88] was being taken.

Q. But we have no, substantially no mixture at the only inlet to the back of this thing and we have a high mixture at the top of it, high concentration.

A. I will not attempt to answer why the concentration here was low. I don't know. There might be various factors. I was primarily concerned with the concentration of the gas in the upper portion of the area behind the furnace.

Mr. Lyon: Would you read that?

(Answer read.)

Mr. Lyon: Q. Now, was the reading made at

Defendant's Exhibit "V"—(Continued)

(Deposition of Henry Landsberg.)

the point under the burner before or after the reading was made at point 11?

A. The reading under the burner was made before point 11.

Q. So you can't justify that low reading by claiming that the bottle was running out of gas, can you?

A. The reading at that particular point was not my sample point. I have not taken that point into consideration in my calculations or in this entire test, because it had no interest to me whatsoever and I could not explain what was going on there.

Q. Now, Mr. Witness, we have an entrance to this whole machine with a reading of 60, did we not?

A. Approximately, yes. [89]

Q. We have a reading of approximately 22 at the only opening into the bottom of the this back cell, didn't we, between the glass and the back of the box?

A. Yes.

Q. Then why, under your assumption, isn't it correct to decide that 11 was the maximum concentration you ever had in the back here and that your formula should be this air in front correlated to this air and that entrance at the back of this burner?

A. We will be very happy to figure it that way.

Q. All right. If you will, please.

Mr. Hoegh: I better have the question read again. I will take full credit for misunderstanding it.

Defendant's Exhibit "V"—(Continued)
(Deposition of Henry Landsberg.)

Mr. Lyon: Let him answer what he thinks.

A. Let's see, we tested 11—

Q. 11 was 60. That is 47, is it?

A. Here is what that will do to this calculation.

Q. All right.

A. It is 30 minus 7 over 47 minus 7 is 23 over 40.

Q. Now, where did you get those figures? As I read this thing, you have got 60 parts put in here going up the front into the furnace. Therefore, 47—or 47 parts going into the furnace. We have got a concentration there in the main flue here of everything that didn't go through under the burner, haven't we? Now, under the burner reading was 22 or 9. In other words, there was 9 parts [90] of concentration or whatever you call these figures, going up the back.

A. No, sir, I don't agree to that.

Q. How would you get any more? You measured right here at the only inlet under the burner to that back flue.

A. That sample was taken at the very bottom one half inch in.

Q. No, I beg to differ. We ran it under the burner, put in under here at the time it was made.

A. No, no.

Q. Yes, we did. We placed that pipe clear in and we made it that way. I have got two witnesses here to testify to that.

Mr. Hoegh: We have got two also.

A. Again—

Defendant's Exhibit "V"—(Continued)

(Deposition of Henry Landsberg.)

Mr. Lyon: I believe the record will show. I asked on the record that the tube was pushed in and we requested it pushed in and the reading was made.

A. This tube here?

Q. Yes, or you had another on the end. You stated on the record it was taken underneath the burner.

Mr. Hoegh: You asked him if it was underneath the burner.

Mr. Lyon: And he said yes.

Mr. Hoegh: All right. I will ask you to look at it [91] right now and it sticks in half an inch from the back of the back wall.

Mr. Lyon: Then the witness wants to state that he didn't make the required correction then or test.

Mr. Hoegh: What required test was that?

Mr. Lyon: I asked him to find me out the concentration at the entrance to this back box. He said it could be achieved there.

Mr. Hoegh: You looked at that tubing there and said to take it there.

Mr. Lyon: If that was moved in say six inches could it have varied to any great extent? It is still—the end of the tube now is sticking in approximately an inch, and is still in the draft which comes up the back, isn't it?

A. Again, I have not studied the flow pattern or the openings that exist in this lower portion of the furnace because they did not concern me or the test.

Defendant's Exhibit "V"—(Continued)
(Deposition of Henry Landsberg.)

Q. Well now—— A. The conditions——

Q. Isn't it a fair assumption that any air that came in here, any SO_2 that came in here, had to come through this opening?

A. Any air that came into where?

Q. Came in the back of this burner between the glass and the back of the burner. [92]

A. Had to come through this opening?

Q. Where that tube is sticking into it.

A. Where the tube is sticking into it, I will not answer to that.

Q. You don't know?

A. I don't know, and also---well, I would say not necessarily so.

Q. Then your gas mixture wasn't homogeneous at any time then?

A. My gas mixture was as homogeneous at the point that I tested as the record of the Titrilog will show.

Q. The whole test rests on the fact that you had a homogeneous mixture of gas, of air and SO_2 , at the time it entered this heater?

Mr. Hoegh: By this heater you mean the secondary heat exchanger?

Mr. Lyon: Q. Any part of it, when it entered the heater.

A. Test number 11 will indicate——

Q. I didn't ask that. I mean, wasn't your entire theory based on having a homogenized mixture?

A. As it entered the furnace?

Defendant's Exhibit "V"—(Continued)

(Deposition of Henry Landsberg.)

Q. At any place in the furnace.

A. I don't care how homogeneous the mixture was as it entered the furnace. I am only interested in the gas being homogeneous at the points that I sampled. [93]

Q. Well, why did you put the paddle wheel in then?

A. To increase the homogeneity of the sample in the back.

Q. Now, Mr. Landsberg, why is not just as true an assumption as your V equals YX to say that the velocity here entering and the one back there are correlated to the one up here on the same type of mathematics that you gave us?

A. I don't believe I understand it.

Q. That all of the SO₂ that went in the upper chamber came up the front of this machine instead of the back of the machine.

A. But I had readings in the back.

Q. Yes, but did you take any readings in the front?

A. I wasn't interested in the readings in the front.

Q. Why not?

Mr. Hoegh: What do you mean as the front?

Mr. Lyon: Q. You mean the gas from here couldn't have got in here?

A. We tested here.

Q. Did you? A. Yes.

Q. You took a little tiny thing and stuck it way

Defendant's Exhibit "V"—(Continued)
(Deposition of Henry Landsberg.)

down inside here, you didn't take it up here where the gas was going in, did you?

A. If we took it up here we would have a considerably [94] lower reading than taking where we took it. We were trying to be as fair as possible by finding out how much of this got into here, and we got it right on the surface. If you recall, I checked several times when he was testing here to make sure he was holding it right on there.

Q. Outside in the air, though.

A. If he got in it would be less.

Q. You mean there is less inside of this chamber that moves up to there?

A. If it were moving up.

Q. Than there is up at the top?

A. I don't know. The important point was to get as close as possible to this and still remain outside in order to get a sample of the air that is being drawn into this vent.

Q. Then the readings vary by where you take your samples?

A. Any sample will vary by where you take your sample.

Q. And how you take it? k

A. Very true. Your results are no better than your sample.

Q. That's right. And this whole test is based on your arbitrarily taking some samples, is it not?

A. I would say arbitrarily. [95]

Q. Well, these samples could vary from minute

Defendant's Exhibit "V"—(Continued)

(Deposition of Henry Landsberg.)

to minute, didn't they? A. How much?

Q. Well, on one test I believe we have 47 against 42. That is around a 12 per cent variation, isn't it?

A. Right, with a time interval in between.

Q. That's right. And also tests at the various inlets varied, didn't they?

A. Tests of the various inlets?

Q. Yes, with the concentration.

A. What inlets?

Q. Well, we have the main inlet when it is first going into the furnace at point 11, and we had the one in the back here under the burner. You had a big variation of 9 against 47, didn't you?

A. I do not consider that my sample point.

Q. I don't care, but you found that, it was in your machine. We took that reading, didn't we?

A. Yes.

Q. And isn't that a variation of around five times? A. Right.

Q. In other words, a variation of about 500 per cent, 9 against 47.

A. That is a difference between two samples of that much, it is not a variation.

Q. It is a variation at the intake to this machine. [96] And weren't these two readings taken one right after the other? A. Very close.

Q. Very close. Would you say that there was any appreciable variation in the amount of SO₂ that was being administered during those tests?

Defendant's Exhibit "V"—(Continued)
(Deposition of Henry Landsberg.)

A. No, but I consider that a very poor sample point.

Q. It is the entrance.

A. The one in back.

Q. Why is that a poor sample point?

A. Because it is right in the edge there where there is evidently some poor contact between the air that is going in and the introduction to the instrument.

Mr. Lyon: May I hear that?

(Last answer read.)

Q. How do you know there was? Did you make any tests to determine that there was a flow of air there or not?

A. I know I got a very low concentration right at that point.

Q. Yes.

A. And I know that the concentration going in was considerably higher.

Q. And also——

A. And the input was not varying anywhere near that much, so therefore I did not consider a good point of [97] sampling.

Q. Now, you stated that the calibration of this instrument has been made, didn't you?

A. Not recently.

Q. Where was it made?

A. Where was what made?

Q. The calibration of this instrument made.

A. The Titrillog, you mean?

Defendant's Exhibit "V"—(Continued)

(Deposition of Henry Landsberg.)

Q. Yes.

A. A calibration in all probability has been made in our laboratory. That is either a long time ago or recently, but I was not concerned with that because I am using strictly relative concentrations.

Q. I am merely trying to find out something about the Titrilog now.

A. All right.

Q. How does moving the instrument affect its calibration?

A. Practically none at all.

Q. It has no variation that way?

A. No. The instrument has been generally used after a calibration by taking it all over the field in the rear of an automobile. I have done so personally and brought it back and rechecked the calibration.

Q. Now, does the accuracy vary with the time and movement from the calibration until it is used?

A. The accuracy varies not with movement, probably with time. That is use time, using the instrument, not sitting.

Q. How long had this instrument been used?

A. How long has this instrument been used?

Q. That you used here yesterday, since it was calibrated last?

A. Since it was calibrated last? I don't know. I didn't care.

Q. It hadn't been used enough to vary its accuracy?

A. It hasn't—

Mr. Hoegh: Pardon me. I would like to hurry this along. This was gone into rather thoroughly

Defendant's Exhibit "V"—(Continued)
(Deposition of Henry Landsberg.)

yesterday and I believe Mr. Landsberg did testify that the calibration of the instrument varied three per cent in any 24-hour period and that since we were not interested in absolute quantities, we were interested in concentrations, the relative concentrations that——

Mr. Lyon: Well, are you testifying, or is Mr. Landsberg testifying?

Mr. Hoegh: I am trying to hurry this along, Mr. Lyon.

Mr. Lyon: I don't think it will help.

A. He is saying essentially what I said the other day, in that the accuracy of the instrument will vary [99] approximately three per cent if calibrated every 24 hours. However, we have paid no attention whatsoever to calibrating it since our entire tests were done in considerably less than a period of 24 hours, and we were interested only in relative concentrations, not actual concentration. If you will ask me what the 57 or the 47 means in concentration, that is grains per hundred cubic feet or parts per million, I could not do so unless I have calibrated the instrument, but since all figures are relative in this particular test, it makes no difference.

Mr. Lyon: Q. Now, my question is, though, not the calibration but the accuracy of it.

A. The accuracy will remain in a 24-hour period plus or minus three per cent.

Q. Thank you.

Defendant's Exhibit "V"—(Continued)

(Deposition of Henry Landsberg.)

A. For a period such as we have tested, probably very, very much less.

Q. Now, have you any idea of the concentration of SO_2 in this machine?

A. I made a rough estimate of an approximate factor which is our calibration.

Q. That is all I want.

A. And I figured that at our introduction when it was around a reading of approximately around 50 would be in the order of seven parts per million.

Q. That is what I wanted. We can state it might [100] vary as far as from five to nine points, though?

A. Somewhere in there, that's right.

Q. Somewhere extremely tenuous concentration?

A. That's right, and if you will note the manner of introduction——

Mr. Hoegh: I object to the word tenuous. It is indefinite.

Mr. Lyon. Q. I will ask the witness, wasn't it a rather tenuous——

Mr. Hoegh: He said what it was.

Mr. Lyon: (Continuing) ——concentration? Isn't that concentration at that level?

A. Just what do you mean by tenuous?

Q. All right. Wasn't it a very extremely diluted concentration?

A. It was an extremely diluted concentration, but relative to what the instrument is sensitive to, it was fairly high.

Defendant's Exhibit "V"—(Continued)
(Deposition of Henry Landsberg.)

Q. I am not questioning the machine itself at all. The machine can't read those things. It is a question I am trying to determine here actually, what ranges we were working in.

A. All right. Roughly in that order.

Q. If the air velocity through the heater were doubled, would it have any change in the Titrilog readings?

A. It would to the extent that we had a constant [101] input of SO_2 into the atmosphere of the tunnel in front of the furnace, and if the furnace were drawing more air then the exchange of air in the tunnel would be more rapid, and therefore the same amount of SO_2 would be introduced into a larger volume of air and therefore your concentrations might be somewhat lower. However, with the excess volume that we have in front of the furnace over that which it draws, I doubt if it would be too much within certain limits.

Q. In other words, a high concentration, the way you administered it, would mean that you had a low velocity of air through the furnace?

A. With regards to what?

Q. A high concentration would mean that you had a low velocity compared with a low concentration where you have a high velocity?

A. If I may inject the same amount of sulphur dioxide from the bottle.

Mr. Hoegh: You are referring specifically to the input into it?

Defendant's Exhibit "V"—(Continued)

(Deposition of Henry Landsberg.)

Mr. Lyon: Pardon, counsel. It is my question.

Mr. Hoegh: I believe that we accorded you considerable leeway in questioning the witness.

Mr. Lyon: This is cross examination, sir.

Mr. Hoegh: During direct and we would like to have the same courtesy extended at this time.

Mr. Lyon: Q. When you have a low velocity you will get a high concentration?

A. A low velocity where?

Q. Any place that this gas is moving.

A. If I have SO_2 coming out of a bottle at a constant rate into air that is moving by it, then the faster the air moves by it the lower the concentration.

Q. That's right.

A. The slower the air moves by the higher the concentration.

Q. All right. Mr. Landsberg, yesterday we made a reading at the top of the stack, didn't we?

A. You mean clear up at the top there?

Q. Yes. A. Yes.

Q. And what was that reading?

A. 3, or a total of 16.

Q. Now, wasn't this burner ported directly out that flue? A. What?

Q. The burner of the furnace, the exhaust gases ported out that flue?

A. You mean the air from—

Q. Well, the exhaust gases from the burner itself.

Defendant's Exhibit "V"—(Continued)
(Deposition of Henry Landsberg.)

A. Yes, probably. I don't know what the exact hook-up is there, but that is straight through to the [103] furnace. I mean, I presume it is, yes.

Q. And the only source of air in there is from the box, is it not? A. Yes.

Q. Now, you were using this natural gas that had mercaptans added to it, were you not?

A. They have some mercaptans in it, naturally.

Q. When these mercaptans burn, they turn to SO_2 , do they not? A. Right.

Q. And you had the SO_2 loaded air entering the bottom of that flue, did you not? A. Yes.

Q. And you had the addition of the additional SO_2 by the burner?

A. Very small amount. By the burning of the gas, you mean?

Q. Yes. A. Yes.

Q. Then how do you explain the fact that the outlet, flue outlet was only three above and yet all the air that went in there started at 60 or better, or 47 or better and had initially SO_2 added to it?

A. You have a large volume of gas being burned there and the amount of sulphur that is in the gas itself is considerably lower than that which we are adding at the [104] bottom, so you have a large dilution taking place.

Q. A dilution from what?

A. From the gas itself.

Q. Doesn't that gas burn into water, carbon dioxide? A. That is gas.

Defendant's Exhibit "V"—(Continued)

(Deposition of Henry Landsberg.)

Q. What was the rate of admission of natural gas?

A. I think it figures around 30 cubic feet per hour.

Q. In other words, about a half a cubic foot a minute?

A. Yes.

Q. And how much air would be required to burn that gas?

A. Oh, I would have to compute that out.

Q. Well, will you do it? Isn't it about eleven times as much air as gas?

A. On a theoretical basis it is only twice—wait a minute. No, wait a minute. That's right, yes, roughly.

Q. Then your dilution could have been not more than one in eleven and probably less because you are adding some SO_2 from the gas?

A. Yes.

Q. Then how can you figure that you got a 16 times lower reading at the top of the flue than at the entrance to the machine?

A. Again, when there are certain tests in this [105] experiment that I was interested in, so I took them my way. Other tests you asked for and I took them your way, such as the bottom of the furnace and the top of there. If I got a low reading like that and it didn't jibe, then I would start probing around all over the furnace. You asked me to hook it there and take a sample. You did not say where or for what.

Defendant's Exhibit "V"—(Continued)
(Deposition of Henry Landsberg.)

Q. I said I wanted a sample of the flue. Now, how did the tests I made differ from any of those you made?

A. The tests that I made, I decided where I wanted to sample and I figured out where would be a good point of sampling. The tests that you made, I sampled simply where you wanted.

Q. To get the answer you wanted, though, that is the reason you took them, though, wasn't it?

A. No, sir. I don't—

Q. I took a test at a point the same as you took it, with the same instrument and everything else.

A. You asked us to take a sample. We stuck a tube there and took a sample. I didn't know what significance the sample would have to what you are going to talk about. Therefore, I didn't care.

Mr. Lyon: I don't think we have any more from this witness.

Mr. Hoegh: Well, I would like to take the measurements on the back of this heater and I have just a few [106] questions. Perhaps we can get this thing wound up before recessing for lunch.

Mr. Lyon: What questions are those?

Mr. Hoegh: I want to ask him to take the measurements on the back of this heater and I want to straighten out a couple of things.

Mr. Lyon: How long do you think you will be?

Mr. Hoegh: Not over ten minutes.

Mr. Lyon: All right. I guess we can wait ten minutes and finish.

Defendant's Exhibit "V"—(Continued)
(Deposition of Henry Landsberg.)

Mr. Hoegh: I don't think we need the back off this if you are satisfied.

Mr. Lyon: Oh, yes, there is one thing I want to know about this one, how you mounted the Economizer on top here, did you put a spacer or anything in there?

Mr. Hoegh: I think you can see that the female extension of the flue, and the Economizer rests down on the top of the upper box, but we can see that.

Mr. Lyon: Mr. Kice, will you examine this and see if that is mounted the way it should be?

Mr. Kice: I can't see with the glass on there.

Mr. Lyon: Could we have the glass taken off?

Mr. Hoegh: Yes.

Mr. Lyon: Can you see it now?

Mr. Kice: Yes. That makes it much better.

Mr. Hoegh: Would you like us to slip the lower back [107] out?

Mr. Lyon: Oh, have you anything while he is taking a look at that? Do you want to introduce these exhibits?

Mr. Hoegh: I want to take measurements of the spacing between the studs.

Redirect Examination

Q. (By Mr. Hoegh): What is the measurement of the spacing between the studs?

A. 14-7/16ths.

Q. Also take it at the bottom.

A. The same, 14-7/16ths.

Defendant's Exhibit "V"—(Continued)
(Deposition of Henry Landsberg.)

Q. Would you likewise measure—let's take it from the bottom of the header plate down to—well, let's take the top down to the level on which the lower back is resting.

A. 56-1/16th plus 2; 58-1/16th.

Mr. Hoegh: Mr. Lyon—

Mr. Lyon: Yes.

Mr. Hoegh: I believe earlier you asked the witness concerning this flange which sticks up. I would like to ask the witness what actually does position the position of the lower back in view of the fact that the header plate is nailed to the wall.

A. I would say the meeting of the male and the female [108] portion of the—what would you call that—flue?

Q. Yes.

A. Would position the lower furnace.

Q. I would like to have the witness read in the results of his calculations on all of these based upon the method of calculation which he developed this morning.

A. I have computed that the amount of air moving by the back furnace, that is, entering into the upper exchanger is 57½ per cent of the total coming out the vent. That is on the furnace with the four foot stack.

Q. Yes. It is in accordance with the formula developed this morning that we went through earlier. Off the record.

(Discussion held off record.)

Defendant's Exhibit "V"—(Continued)

(Deposition of Henry Landsberg.)

Mr. Lyon: This last one was the four foot?

A. Four foot.

Mr. Lyon: The last answer you gave?

A. Yes.

Mr. Lyon: That is plus or minus what accuracy?

A. Plus or minus roughly ten per cent of the per cent.

Mr. Lyon: In other words, that answer was what? A. 57.

Mr. Hoegh: Call it 57 plus or minus 6 per cent.

Mr. Lyon: It could be from 51 up to 62, somewhere in that range? A. Right. [109]

Mr. Lyon: Let him get through with direct examination.

A. You want me to answer for this?

Mr. Hoegh: Q. I believe you gave that one earlier this morning. The figure was 24 per cent?

A. Right.

Mr. Hoegh: No further questions.

Mr. Lyon: No further questions? I would like to have, if you are going to use those photographs, let's have them identify them, mark them as exhibits.

Mr. Hoegh: Q. Exhibit 2, I would like to show you, Mr. Landsberg, and ask you what does that depict?

A. That is the sulphur dioxide introductory system which introduced the sulphur dioxide into the air in the tunnel. Describe it?

Mr. Lyon: No, that is all right.

Defendant's Exhibit "V"—(Continued)
(Deposition of Henry Landsberg.)

Mr. Hoegh: Q. Does that represent the manner in which sulphur dioxide was introduced in the tests which were conducted here?

A. Yes, minus one panel.

Q. Yes. I believe that was explained in the earlier portions of the testimony.

Would you mark this photograph which I now hand you as Exhibit 6?

(Whereupon the photograph referred to was marked as Plaintiff's Exhibit 6 by the Notary Public.) [110]

[See Exhibit 29D in the Book of Exhibits.]

Mr. Hoegh: Q. I ask you now, Mr. Witness, I hand you that Plaintiff's Exhibit 6, what does that depict?

A. The back of the furnace as showing the gas introductory, the heating gas introductory line.

Q. The furnace nearest that, could you identify that, please?

Mr. Lyon: Which furnace is this a photograph of?

A. That is the three foot heat exchanger.

Mr. Hoegh: Q. And the far one with the tunnel attached to it is which furnace?

A. The one with the four foot heat exchanger.

Mr. Lyon: Which one?

Mr. Hoegh: The far one with the tunnel attached right here.

Mr. Lyon: Oh.

Mr. Hoegh: Q. Does that depict the test setup

Defendant's Exhibit "V"—(Continued)

(Deposition of Henry Landsberg.)

on the heaters, the fact of the heaters as they were conducted or the tests were conducted on them here?

A. Right.

Q. I would like to point out the numbers 1, 2, 3 and 4 which appear on the closest heater and also the numbers 1, 2, 3 and 4 which appear on the farthest heater in Plaintiff's Exhibit 6, and ask if those are test points which were used for these tests to which we have referred?

A. They were.

Mr. Hoegh: Would you mark this photograph as [111] Exhibit 7, please?

(Whereupon the photograph referred to was marked as Plaintiff's Exhibit 7 by the Notary Public.)

[See Exhibit 29 in the Book of Exhibits.]

Mr. Hoegh: Q. I show you now, Mr. Landsberg, Plaintiff's Exhibit 7 and ask you what that depicts?

A. That is the furnace with the—the test furnace with the four foot heat exchanger and the tunnel, test tunnel in front of it.

Q. Does that represent the test setup as it was actually conducted here? A. Yes.

Mr. Hoegh: I hand you this photograph, Mr. Reporter, and I would like to introduce this as Plaintiff's Exhibit 8.

Defendant's Exhibit "V"—(Continued)
(Deposition of Henry Landsberg.)

(Whereupon the photograph referred to was marked as Plaintiff's Exhibit 8 by the Notary Public.)

Mr. Hoegh: Q. I show you now, Mr. Landsberg, a photograph marked as Plaintiff's Exhibit 8 and ask you what that depicts?

A. That is the furnace, test furnace with the three foot heat exchanger without the test tunnel.

Q. Does that show the three foot—or you said the furnace with the three foot secondary heat exchanger that was actually tested, upon which tests were run here? A. Yes.

Q. I would like to call your attention to the heater in the left-hand side of the photograph and ask you what [112] that shows?

A. That shows the test heater with the four foot heat exchanger with the test tunnel attached.

Mr. Hoegh: Off the record.

(Discussion held off record.)

Mr. Hoegh: Would you mark this as Plaintiff's Exhibit 9?

(Whereupon the photograph referred to was marked as Plaintiff's Exhibit 9 by the Notary Public.)

[See Exhibit 29C in the Book of Exhibits.]

Mr. Hoegh: Q. Mr. Landsberg, I show you a photograph which has been marked Plaintiff's Exhibit 9 and ask you what that depicts?

Defendant's Exhibit "V"—(Continued)
(Deposition of Henry Landsberg.)

A. That is the top portion of a test furnace, the one with the three foot heat exchanger.

Q. Does that show the test points 5A, 5B and 5C that were used in these tests?

A. They do.

Q. And points 7 and 8? A. They do.

Q. Were the same points used on the heater with the four foot heat exchanger?

A. Right.

Q. By that I mean the location of the points were the same on the heaters?

A. They were the same.

Mr. Hoegh: Off the record. [113]

(Discussion held off record.)

Mr. Lyon: Defendant's counsel will agree to be responsible and take possession of Exhibits 1, 3, 4, and 5, and we will give them to counsel for plaintiff upon request.

Mr. Hoegh: That is perfectly agreeable with me. Off the record.

(Discussion held off record.)

Mr. Hoegh: It has been stipulated that Plaintiff's Exhibits 2, 6, 7, 8, and 9 have been sufficiently identified.

Mr. Lyon: Yes.

Mr. Hoegh: Do you want any of this stuff kept intact, the heaters?

Mr. Lyon: I don't want any of it.

Mr. Hoegh: We are going to have it here.

Mr. Lyon: Is that all?

Defendant's Exhibit "V"—(Continued)
(Deposition of Henry Landsberg.)

Mr. Hoegh: Yes.

Mr. Lyon: I want to give you notice of two more patents as prior art. I am giving you notice of a patent to Snyder, 2093492 of September 21, 1937.

Mr. Hoegh: With a number like that?

Mr. Lyon: Yes. And patent to Bason and McGarrigal, 786713 of April 4th, 1905. That is prior art which the defendants will rely upon at the trial.

Mr. Hoegh: It is stipulated that this deposition [114] may be signed before any notary?

Mr. Lyon: Certainly. Could we remove this a minute?

Mr. Hoegh: Certainly.

Mr. Lyon: We will now call the deposition for which we received notice closed?

Mr. Hoegh: Yes.

/s/ HENRY LANDSBERG,
Witness. [115]

State of California,
County of Los Angeles—ss.

I, Lenore Tafoya, Notary Public in and for the County of Los Angeles, State of California, do hereby certify:

That on the 7th day of January, 1955, before me personally appeared Henry Landsberg, the witness whose deposition appears hereinbefore.

That the said witness was by me duly advised of the right to make such changes and corrections in

Defendant's Exhibit "V"—(Continued)

(Deposition of Henry Landsberg.)

the within transcript as might be necessary in order to render the same true and correct;

That the said witness stated to me that the said deposition had been read to or by him, and he, having made such changes and corrections as he desired thereupon, subscribed and swore to the said deposition in my presence;

In Witness Whereof, I have hereunto subscribed my name and affixed my seal of office the date hereinabove written.

[Seal] /s/ LENORE TAFOYA,

Notary Public in and for the County of Los Angeles, State of California.

[Endorsed]: Filed January 11, 1955.

DEFENDANT'S EXHIBIT "Y"

MINUTES OF NEW PRODUCTS COMMITTEE
MEETING

Thursday, August 14, 1952, 2:30 p.m., Sales Conference Room

* * * * *

Economizer for Gas Wall Heaters

Dean Olds explained the situation in which we have been involved with AGA on approval of our new line of gas wall heaters and the extended header and economizer. He mentioned that our Models 65 and 66 have been approved for use with our extended header; however, we have not been able as yet to receive approval for using metalbestos for venting these heaters.

Dean then advised the group that he had just received word from AGA that our economizer for use with the Models 67, 68, 69 and 64 had been disapproved by AGA. This is the second unit which we have submitted in an effort to cooperate with AGA in designing an economizer to overcome some of the difficulties which they feel were involved in our original design. He mentioned he had recently received the patent information on the Holly unit similar to our economizer and after a careful review he was of the opinion our present economizer would infringe on their patent.

It was the recommendation of the design department that we develop an economizer with two registers which they felt may have a chance to pass AGA and in their opinion would not infringe on Holly's

patent. Naturally, design could not definitely say such an economizer would meet AGA requirements, but they did feel it would overcome the main objection which they raised with regard to our present economizer which was the fire hazard. Harry Giewosky then illustrated on the blackboard how our blower would work in conjunction with the two-register economizer. He mentioned this would necessitate no changes in the design of the blower and it would work very effectively with this arrangement.

After further discussion it was agreed we would proceed with the manufacture of the Models 65 and 66 with 65-310 Extended Header. There were some recommendations that it may be advisable to proceed with the manufacture of our current line until we could resolve all of the AGA problems in which we are now involved. However, upon checking our raw material inventory it was determined we will have material available for the production of our new line of heaters, but this material is not of the proper gauge and size to be transferred to our old line of wall heaters. Therefore, it was quite obvious that if we pursued this course of action we would lose considerable wall heater business because products would just not be available. If on the other hand we decide to proceed with the new line and cannot resolve the economizer problem, we run the risk of being out of 35,000 BTU Input models.

After careful consideration the group felt it advisable to proceed with the production of Models 65 and 66 which use the 65-310 Extended Header and then move right into the manufacture of

Models 67 and 68 which are the 35,000 BTU input models and require the economizer. In a few weeks we should be able to determine whether our economizer with two registers will be approved by AGA. If it should be approved we will have 35,000 BTU input units available for shipment. In the event the worst might happen and we cannot resolve the economizer problem, we can still sell the Models 67 and 68 for use with the 65-310 Extended Header as 25,000 BTU input models.

* * * * *

[Endorsed]: No. 14711. United States Court of Appeals for the Ninth Circuit. The Coleman Company, Inc., a corporation, Appellant, vs. Holly Manufacturing Company, a corporation, Appellee. Transcript of Record. Appeal from the United States District Court for the Southern District of California, Central Division.

Filed: April 2, 1955.

/s/ PAUL P. O'BRIEN,
Clerk of the United States Court of Appeals for
the Ninth Circuit.

In the United States Court of Appeals
for the Ninth Circuit

No. 14711

THE COLEMAN COMPANY, INC., a corporation
of Kansas, Appellant,

vs.

HOLLY MANUFACTURING COMPANY, a cor-
poration of California, Appellee.

NOTICE OF ADOPTION OF STATEMENT
OF POINTS

Appellant hereby adopts as its statement of points under Rule 19(6) on its appeal the concise statement of points on appeal under Rule 75(a) appearing in the transcript of the record certified by the Clerk of the District Court and filed herein.

Dated this 7th day of April, 1955.

LYON & LYON,

/s/ By FREDERICK W. LYON,

Attorneys for Defendant-Appellant

Affidavit of Service by Mail attached.

[Endorsed]: Filed Apr. 8, 1955. Paul P. O'Brien,
Clerk.

